Universidade do Minho
Escola de Economia e Gestão

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The Determinants of International Equity and Bond Investment

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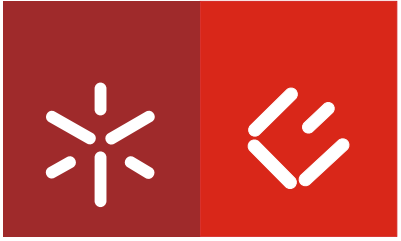

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The Determinants of International Equity and Bond Investment

Tese de Doutoramento em Ciências Empresariais

Setembro de 2012

The Determinants of International Equity and Bond Investment

Abstract

The purpose of this research is fourfold.

First, to investigate whether the determinants of international equity investment differ between investors with different degrees of information, experience and sophistication. For this purpose, the determinants of international equity investment of institutional and noninstitutional investors from 20 OECD countries, in the period 2001-2009, were analysed and compared. The results show that there are significant differences in the determinants of international equity investment between institutional and noninstitutional investors. Particularly, noninstitutional investors exhibit a more pronounced preference for equities of geographical nearby, contiguous and more transparent countries than institutional investors, suggesting that the effect of information costs and familiarity on international equity investment is stronger for less informed, experienced and sophisticated investors. Moreover, the preference for more developed equity markets and the contrarian behaviour are more severe for noninstitutional investors. Hence, the heterogeneity of institutional and noninstitutional investors in international equity investment is not negligible and therefore should be taken into account.

Second, to investigate whether the determinants of international bond investment differ between investors with different degrees of information, experience and sophistication. For this purpose, the determinants of international bond investment of institutional and noninstitutional investors from 20 OECD countries, in the period 2001-2009, were analysed and compared. The results show that there are few significant differences in the determinants of international bond investment between institutional and noninstitutional investors. Particularly, the preference for bonds of more transparent countries and the return chasing behaviour are more pronounced for noninstitutional investors, whereas the preference for bonds with lower risk diversification potential is more pronounced for institutional investors. Hence, not only the results for international bond investment do not allow to support (or reject) the argument that information costs and familiarity are more important for less informed, experienced and sophisticated investors, but also they are contrary to the idea that financial variables, namely return and risk diversification, are more important for more informed, experienced and sophisticated investors.

Third, to investigate whether the determinants of international equity investment differ from the determinants of international bond investment. For this purpose, the determinants of both international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries, in the period 2001-2009, were analysed and compared. The results show that, although the effect of information costs on international equity investment tends to be stronger than on international bond investment, the differences between assets are not usually statistically significant, especially when the influence of financial variables is taken into account. Hence, it is not possible to conclude that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others.

Fourth, to investigate whether the flight to quality phenomenon is also observable in international investment and whether the flight to quality phenomenon is more pronounced for more sophisticated than for less sophisticated investors. For this purpose, a two-factor and three-factor ANOVA models, respectively, were applied to the international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries in the period 2001-2009. The results suggest that the flight to quality phenomenon is also observable in international investment, as a change from business cycle of expansion to recession causes investors to significantly decrease the average weight invested in more risky assets (equities) and increase the average weight invested in less risky assets (bonds). The results also show that the variation on the average weight assigned to each type of asset, due to changes in business cycles, is significantly stronger for institutional investors than for noninstitutional

investors, thereby suggesting that the flight to quality phenomenon is more pronounced for more sophisticated than for less sophisticated investors.

Os Determinantes do Investimento Internacional em Ações e Obrigações

Resumo

O presente trabalho de investigação pretendeu alcançar quatro objetivos.

Primeiro, investigar se os determinantes do investimento internacional em ações diferem entre investidores com diferentes graus de informação, experiência e sofisticação. Para o efeito, foram analisados e comparados os determinantes do investimento internacional em ações dos investidores institucionais e não institucionais de 20 países da OCDE, no período 2001-2009. Os resultados mostram que existem diferenças significativas nos determinantes do investimento internacional em ações dos investidores institucionais e não institucionais. Em particular, os investidores não institucionais exibem uma preferência mais pronunciada pelas ações de países geograficamente mais próximos, contíguos e mais transparentes do que os investidores institucionais, o que sugere que o efeito dos custos de informação e da familiaridade sobre o investimento internacional em ações é mais forte para os investidores menos informados, experientes e sofisticados. Acresce que a preferência por mercados acionistas mais desenvolvidos e o comportamento contrário à procura da rendibilidade também se mostram mais severos para os investidores não institucionais. Assim, a heterogeneidade dos investidores institucionais e não institucionais no investimento internacional em ações não é negligenciável, pelo que deverá ser tida em conta.

Segundo, investigar se os determinantes do investimento internacional em obrigações diferem entre investidores com diferentes graus de informação, experiência e sofisticação. Para o efeito, foram analisados e comparados os determinantes do investimento internacional em obrigações dos investidores institucionais e não institucionais de 20 países da OCDE, no período 2001-2009. Os resultados mostram que há poucas diferenças estatisticamente significativas nos determinantes do investimento internacional em obrigações dos investidores institucionais e não institucionais. Em particular, a preferência pelas obrigações de países mais transparentes e o comportamento de procura da rendibilidade são significativamente mais pronunciados nos investidores não institucionais, ao passo que a preferência pelas obrigações com menor potencial de diversificação do risco é significativamente mais pronunciada nos investidores institucionais. Assim, não só os resultados não permitem confirmar (nem tão-pouco rejeitar) o argumento que os custos de informação e a familiaridade afetam mais o investimento internacional em obrigações dos investidores menos informados, experientes e sofisticados, como também são contrários à ideia de que as variáveis financeiras, nomeadamente a rendibilidade e a diversificação do risco, afetam mais o investimento internacional em obrigações dos investidores mais informados, experientes e sofisticados.

Terceiro, investigar se os determinantes do investimento internacional em ações diferem dos determinantes do investimento internacional em obrigações. Para o efeito, foram analisados e comparados os determinantes do investimento internacional em ações e em obrigações dos investidores institucionais e não institucionais de 20 países da OCDE, no período 2001-2009. Os resultados mostram que, apesar do efeito dos custos de informação e da familiaridade sobre o investimento internacional em ações ser mais pronunciado do que sobre o investimento internacional em obrigações, as diferenças por ativo não se mostram, em geral, estatisticamente significativas, sobretudo quando a influência das variáveis financeiras é tida em conta. Assim, os resultados não permitem concluir que o investimento internacional em ações é mais intensivo em informação do que o investimento internacional em obrigações, tal como sugerido por Gehrig (1993) e Portes, Rey e Oh (2001), entre outros.

Quarto, investigar o fenómeno da fuga para a qualidade e averiguar se tal fenómeno é mais pronunciado nos investidores mais sofisticados do que nos menos sofisticados. Para o efeito, aplicou-se o modelo Anova a dois e a três fatores, respetivamente, ao investimento internacional em ações e em obrigações dos investidores institucionais e não institucionais de 20 países da OCDE no período 2001-

2009. Os resultados sugerem que o fenómeno da fuga para a qualidade também é observável no investimento internacional já que a alteração do ciclo económico, de expansão para recessão, provoca uma redução significativa no peso médio atribuído aos ativos de maior risco (ações) e um aumento significativo no peso médio atribuído aos ativos de menor risco (obrigações). Os resultados mostram ainda que a variação no peso médio atribuído a cada tipo de ativo, resultante da alteração do ciclo económico, é significativamente mais forte para os investidores institucionais do que para os não institucionais, sugerindo que o fenómeno da fuga para a qualidade é mais pronunciado nos investidores mais sofisticados do que nos menos sofisticados.

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Chapter 1: Introduction

1.1 Research area

The potential benefits of international portfolio investment are widely recognized and well documented in the finance literature: international portfolio investment allows investors to further reduce the risk and increase the expected return of their portfolios (e.g. Solnik 1974a, Odier and Solnik 1993). In view of these arguments, rational investors should hold internationally diversified portfolios. In fact, the international Capital Asset Pricing Model (CAPM) sustains that, in equilibrium, investors worldwide should hold the world market portfolio, which is internationally diversified according to the weight of each country in the world market capitalisation. However, despite the considerable increase in international portfolio investment in recent years, there is clear evidence that the portfolio held by investors differs substantially from the world market portfolio (e.g. French and Porteba 1991; Cooper and Kaplanis 1994, Tesar and Werner 1995). Indeed, in relation to the optimal weights predicted by the international CAPM, investors tend to, on the one hand, overweight domestic assets in their portfolios (home bias) and, on the other hand, underweight foreign assets in their portfolios (foreign bias). These phenomena provide strong evidence that there are other factors, in addition to risk and return, that influence international portfolio investment and that are not properly incorporated in financial theory.

Several factors that could inhibit international portfolio investment, and thereby explain the apparently paradoxical phenomena of the home and foreign biases, are put forward in the literature, specifically: the need to hedge domestic specific risks; direct and indirect barriers to international portfolio investment, such as capital market controls, taxation and transaction costs; information costs; destination country transparency and corporate governance; and investor behavioural biases based on familiarity, recognition, optimism, overconfidence, to name a few.

Recent empirical studies find strong support for the important role of information costs and familiarity in explaining international portfolio investment. This evidence suggests, as highlighted by Tesar and Werner (1995), that “other factors such as geographic proximity, strong trade linkages or the lack of a language barrier may matter potentially even more than the diversification motive per se for international portfolio choice” (Tesar and Werner, 1995, pp. 477).

In this context, several questions arise. What drives international portfolio investment? Are information costs and familiarity more relevant to investors than international diversification benefits? Is this so for investors with different degrees of information, experience and sophistication? Is this so for assets with different informational requirements? Do business cycles influence international portfolio investment?

Empirical studies in this area have focused on finding answers to some of these questions, but others remain unexplored. This research aims to contribute to the literature in this area by addressing in a comprehensive manner these questions.

1.2 Motivation and purpose of the research

The purpose of this research is fourfold.

First, to investigate whether the determinants of international equity investment differ between investors with different degrees of information, experience and sophistication. For this purpose, the determinants of international equity investment of institutional and noninstitutional investors are analysed and compared. This first objective is motivated by the argument that international equity investment of more informed, experienced and sophisticated investors (such as institutional investors) should be less influenced by information costs and familiarity than international equity investment of less informed, experienced and sophisticated investors (such as noninstitutional investors), as suggested by the information costs theory and the studies of Grinblatt and Keloharju (2001), De Marzo, Kaniel and Kremer (2004) and Massa and Simonov (2006).

Second, to investigate whether the determinants of international bond investment differ between investors with different degrees of information, experience and sophistication, such as institutional and noninstitutional investors. This second objective is motivated by the same reason as the first, i.e., the claim that international bond investment of more informed, experienced and sophisticated investors should be less influenced by information costs and familiarity than international bond investment of less informed, experienced and sophisticated investors.

Third, to investigate whether the determinants of international equity investment differ from the determinants of international bond investment. This third objective is motivated by the idea that international equity investment should be more sensitive to information costs and familiarity than international bond investment since “the informational requirements for valuing equities are much larger than for valuing bonds” (Gehrig, 1993, pp. 101).

Fourth, to investigate whether a change in business cycles from expansion to recession causes investors to decrease (increase) international equity (bond) investment and whether this flight to quality phenomenon is more pronounced for institutional than for noninstitutional investors. This fourth objective is motivated by the idea that a change in business cycles from expansion to recession should cause investors to decrease (increase) international investment in assets with higher (lower) degree of risk, according to the flight to quality phenomenon, as well as the argument that this phenomenon is more pronounced for more sophisticated investors than for less sophisticated investors, as suggested by Chalmers, Kaul and Phillips (2010).

1.3 Contributions

This dissertation performs a comprehensive investigation of the determinants of international equity and bond investment. By considering the international investment of investors with different levels of information, experience and sophistication (institutional and noninstitutional investors) in assets with different informational requirements and different degrees of risk (equity and bond) throughout different business cycles (expansion and recession), this research offers important contributions to the literature.

First, this research compares the determinants of both international equity and bond investment between investors with different degrees of information, experience and sophistication. This issue has not been addressed by previous studies since they either consider all investors aggregately (e.g. Ferreira and Miguel 2007, 2011), thereby implicitly assuming that investors with different characteristics have homogeneous preferences, or only one type of investor, such as mutual funds (e.g. Chan, Covrig and Ng 2005) or households (e.g. Kyrychenko and Shum 2006). Moreover, this research is also innovative by taking into account the influence of business cycles in the international investment process. This issue has not been addressed by previous studies, since they only consider one year (e.g. Faruqee, Li and Yan 2004, Coeurdacier and Martin 2007), two years (e.g. Chan, Covrig and Ng 2005, De Santis and Gérard 2006), or three or more discontinuous years of investment analysis (e.g. Ferreira and Miguel 2007, 2011).

Second, this research compares the determinants of international investment between assets with different informational requirements and, above all, it provides a statistical significance for the differences. In fact, the majority of empirical studies to date have focused on the determinants on international equity investment and, to a lesser extent, on the determinants on international bond investment, without providing a comparison of those

determinants by asset. The studies of Portes, Rey and Oh (2001), De Santis and Gérard (2006), Coeurdacier and Martin (2007), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012) analyse the determinants of both international equity and bond investment and, therefore, set the conditions for a comparison of those determinants between assets. However, these studies are limited since, with the exception of Daude and Fratzscher (2008), they do not provide the statistical significance of the differences found. Moreover, the influence of business cycles, as well as of different types of investors is also taken into account. This issue has not been addressed by previous studies, since they only consider one year (e.g. Coeurdacier and Martin 2007), two years (e.g. De Santis and Gérard 2006), or three or more discontinuous years of investment analysis (e.g. Daude and Fratzscher 2008) and since they consider all investors aggregately (e.g. De Santis and Gérard 2006, Coeurdacier and Martin 2007, Daude and Fratzscher 2008, Aggarwal, Kearney and Lucey 2012).

Third, this research analyses whether the flight to quality phenomenon is also observable in international investment. In fact, although the idea behind the flight to quality phenomenon is pretty intuitive, empirical evidence on its prevalence is very scarce and mostly confined to domestic investment (e.g. Kaul and Phillips 2007, Chalmers, Kaul and Phillips 2010). Moreover, this research analyses whether the flight to quality phenomenon in international investment is more pronounced for more sophisticated investors than for less sophisticated investors. As far as I am aware of, only Chalmers, Kaul and Phillips (2010) address this question, yet at the level of domestic, rather than international, investment.

1.4 Plan of presentation

This research is organised into seven chapters, the first of which corresponds to this introductory chapter. Chapter 2 presents a brief review of the literature on international portfolio investment, thereby providing the theoretical background for the empirical studies developed in chapters 3 to 6. Specifically, Portfolio Theory and the CAPM are revisited and extended to the international level, in order to highlight the benefits and the additional sources of risk of international investment. The home and foreign biases, as well as the theoretical explanations for these phenomena, are also discussed. Considered together, these theories are central to the definition of the determinants of international portfolio investment. Attention is also devoted to the theoretical framework proposed by Martin and Rey (2004) for the use of gravity models in the context of international portfolio investment. Prior research on the determinants of international portfolio investment is also reviewed and discussed.

Chapter 3 investigates whether the determinants of international equity investment differ between institutional and noninstitutional investors. After presenting the research design, the empirical results on the determinants of international equity investment of both institutional and noninstitutional investors and the respective differences are presented and analysed. The robustness of results to the consideration of different business cycles is also tested.

In chapter 4 a similar analysis is conducted but considering international bond investment. Thus, chapter 4 investigates whether the determinants of international bond investment differ between institutional and noninstitutional investors. After presenting the research design, the empirical results on the determinants of international bond investment of both institutional and noninstitutional investors and the respective differences are presented and analysed. The robustness of results to the consideration of different business cycles is also verified.

Chapter 5 investigates whether the determinants of international equity investment differ from the determinants of international bond investment. After presenting the research design, the empirical results on the determinants of both international equity and bond investment and the respective differences are presented and discussed. The robustness of results to the consideration of different business cycles as well as to the consideration of different types of investors is also checked.

Chapter 6 investigates whether the flight to quality phenomenon is also observable in international investment, i.e., whether a change in business cycles from expansion to recession causes investors to decrease (increase) international equity (bond) investment. Furthermore, it also investigates whether this flight to quality phenomenon is more pronounced for more sophisticated (institutional) than for less sophisticated (noninstitutional) investors. Thus, after presenting the research design, the empirical results are presented and analysed.

Finally, chapter 7 concludes by summarising the main results and the main limitations of this research and suggesting possible lines for future investigation.

Chapter 2: Literature Review

2.1 Introduction

This chapter presents a brief review of the theoretical and empirical literature on international portfolio investment. At the theoretical level, Portfolio Theory and the Capital Asset Pricing Model (CAPM) are revisited and extended to the international level, in order to highlight the benefits and the additional sources of risk of international investment. The home and foreign biases, as well as the theoretical explanations for these phenomena, are also discussed. Considered together, these theories are central to the definition of the determinants of international portfolio investment. This chapter also focuses on the use of gravity models in the context of international portfolio investment. Specifically, the theoretical framework proposed by Martin and Rey (2004) is presented. The model of Martin and Rey (2004) has provided an inestimable contribution to the literature in this area and has been the theoretical support of several empirical studies on the determinants of international portfolio investment, with highly successful results. It will also be used as the basis of the econometric analysis in the next chapters.

At the empirical level, prior research on the determinants of international portfolio investment is reviewed and discussed. Empirical studies on this area tend to differ on the basis of the sample and variables selected, making the results hardly comparable. In respect to the sample considered, empirical studies are classified according to several criteria, such as the sample of investment origin and destination countries, the type of asset and investors considered, as well as the period of investment under analysis. The most commonly used measures to assess international portfolio investment and its determinants are also highlighted. Empirical evidence on the determinants of international equity and bond investment is then discussed. Thus, this chapter provides the theoretical and empirical background for the empirical studies developed in the following chapters.

This chapter is structured as follows. Section 2 reviews portfolio theory and its extension to an international setting. Section 3 presents the traditional version of CAPM and its extension to an international setting. Section 4 introduces the concepts of home and foreign biases in investment portfolios, as well as reviews the theoretical explanations for these phenomena. Section 5 presents the theoretical framework proposed by Martin and Rey (2004) for the application of gravity models in the context of international portfolio investment. Section 6 reviews prior research on the determinants of international portfolio investment.

Finally, section 7 provides a summary of the theoretical and empirical literature on international portfolio investment.

2.2 Portfolio Theory

2.2.1 Domestic diversification and portfolio risk reduction

The mean-variance model, developed by Markowitz's (1952), is the cornerstone of Portfolio Theory. It establishes the principles for quantifying expected return and risk and for constructing and selecting, on the basis of these two parameters, efficient portfolios, i.e., those that, within a universe of investment possibilities, offer, to risk-averse investors, the lowest risk for a given level of expected return and the highest expected return for a given level of risk.

According to the mean-variance model, the expected return of a portfolio *p*, composed by *n* assets, is simply the weighted average of its assets' returns, as shown in equation 2.1:

$$E(R_{\boldsymbol{p}}) = \sum_{i=1}^{n} w_i . E(R_i) \qquad \textbf{(2.1)}$$

where $E(R_p)$ is the expected return of portfolio *p*, $E(R_i)$ is the expected return of asset *i* and w_i is the portfolio weight invested in asset *i*.

On the other hand, the risk of the same portfolio *p*, composed by *n* assets, is measured by the standard deviation of returns, as shown in equation 2.2:

$$\sigma_p = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} w_i . w_j . \sigma_{ij} \right)^{\frac{1}{2}} = \left(\sum_{i=1}^{n} \sum_{j=1}^{n} w_i . w_j . \sigma_i . \sigma_j . \rho_{ij} \right)^{\frac{1}{2}} \qquad \textbf{(2.2)}$$

where σ_p is the standard deviation of returns of portfolio *p*, w_i and w_j are the portfolio weights invested in asset *i* and asset *j*, respectively, and σ_{ij} is the covariance between the return on asset *i* and the return on asset *j*, which, in turn, is equal to the product of the standard deviation of returns of asset *i* (σ_i), the standard deviation of returns of asset *j* (σ_j), and the correlation coefficient between the returns of asset *i* and asset *j* (ρ_{ij}).

Thus, while the expected return on a portfolio depends solely on the expected return of its assets, the risk of a portfolio depends not only on the risk of its assets but also on the covariance, and thus the correlation coefficient, between each pair of assets comprising the portfolio. As long as the assets comprising the portfolio are not perfectly positively correlated,

the risk of the portfolio will always be less than the weighted average of the risk of its component assets. *Ceteris paribus*, the lower the correlation coefficient between assets, the lower portfolio risk will be. Thus, by combining assets with low return correlation it is possible to reduce portfolio risk without sacrificing expected return.

Furthermore, portfolio risk will decrease as the number of assets included in the portfolio increases. Portfolio risk reduction is, however, made at a decreasing marginal rate. In fact, the risk reduction achieved by adding an extra asset to the portfolio becomes smaller and it is limited to systematic or domestic market risk, i.e., the component of total risk that affects the return of all assets and, as such, cannot be reduced or eliminated through diversification (Sharpe 1963).

Figure 2.1 illustrates portfolio risk reduction as the number of assets included in portfolio increases[1]. The marginal reduction in risk becomes smaller as more assets are added to the portfolio and even with extensive diversification portfolio risk can never be eliminated below the level of systematic or domestic market risk, since all domestic assets tend to be affected by common sources of risk.

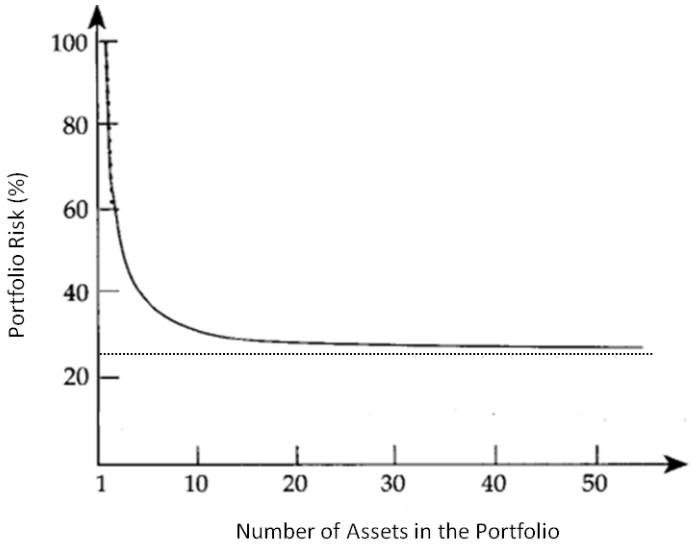

Figure 2.1: Diversification and portfolio risk reduction

Source: Adapted from Solnik (1974a)

[1] The analysis is conducted by Solnik (1974a) for the U.S. market. The vertical axis measures the risk of a portfolio composed by *n* assets relatively to the risk of a domestic asset, while the horizontal axis measures the number of assets included in the portfolio.

2.2.2 Optimal portfolio selection

From the efficient frontier, i.e., the set of portfolios with lower risk for a given level of expected return, investors will choose the portfolio that maximizes their individual utility function. The optimal portfolio of each investor will therefore lie in the tangency point between the efficient frontier and the set of individual indifference curves[2].

Figure 2.2 illustrates the optimal portfolio selection of two investors, X and Y, with different preferences. Both investors choose a portfolio from the efficient frontier. However, since investor X is more risk averse than investor Y, his optimal portfolio (X*), which lie on the tangency point between the efficient frontier and his indifference curves, will have a lower level of risk and expected return than the optimal portfolio of investor Y (Y*).

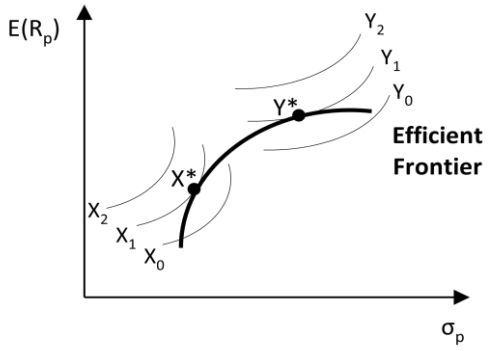

Figure 2.2: The efficient frontier and optimal portfolio selection

In the optimal portfolio selection process, Tobin (1958) suggests that the combination of a risk-free asset with an efficient portfolio of risky assets will allow investors to bear a lower level of risk for any level of expected return. The optimal portfolio will lie along the Capital Market Line (CML), which intercepts the axis of expected return at the level of the risk-free rate and is tangential to the efficient frontier (the set of efficient risky portfolios). It follows the Separation Theorem, according to which all investors, regardless of their level of risk aversion, will apply a proportion of their wealth in the market portfolio[3] and the remaining in the risk-

[2] In the context of portfolio theory, indifference curves represent different combinations of expected return and risk that provide the same welfare or utility to the investor. Since investors are assumed to be risk averse and to always demand a return for engaging in risky investments, indifference curves are convex and positively sloped. More risk averse investors will have steeper indifference curves since, to maintain the same level of utility, they will demand a higher increase in expected return to bear additional risk.

[3] Theoretically, the market portfolio is composed by all risky assets traded in the domestic market, in proportions equal to the contribution of each asset to the domestic market capitalization.

free asset. As a consequence, the expected return and risk of the individual optimal portfolio will be given by equations 2.3 and 2.4, respectively:

$$E(R_p) = w_m . E(R_m) + (1 - w_m) . r_f \quad \textbf{(2.3)}$$

$$\sigma_p = w_m . \sigma_m \quad \textbf{(2.4)}$$

Where w_m is the weight invested in the market portfolio, $E(R_m)$ and σ_m is the expected return and the risk of the market portfolio, respectively, and r_f is the return on the risk-free asset.

Figure 2.3 illustrates the optimal portfolio selection in the presence of a risk-free asset. The efficient portfolio of risky assets chosen by all investors is the market portfolio (portfolio M). The optimal portfolio chosen by each investor, i.e., the combination of the risk-free asset and the market portfolio that maximizes his utility, is located in the tangency point between the CML and the set of indifference curves. Note that the optimal portfolio of investor X and Y, X* and Y*, respectively, lie now in a higher indifference curve in relation to the previous scenario where no risk-free asset was considered (figure 2.2), meaning that both investors have achieved a higher level of utility with the combination of the risky portfolio and the risk-free asset.

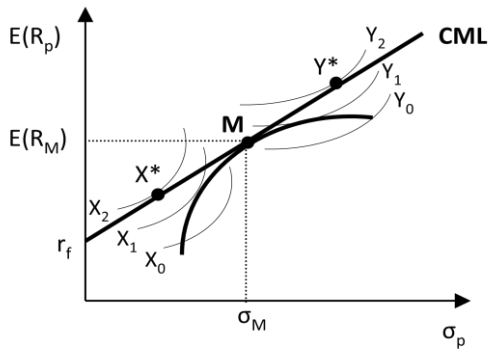

Figure 2.3: The Capital Market Line (CML) and optimal portfolio selection

2.2.3 International diversification and optimal international portfolio selection

In his seminal work, Solnik (1974a) shows that international diversification allows investors to achieve a lower level of portfolio risk than that obtained by exclusively domestic diversification in so far as the return correlation coefficient between assets of different

countries is considerable lower than between assets of the same country, due to industry and/or country specific factors[4].

Figure 2.4 shows the portfolio risk reduction effect of diversification considering an exclusively domestic portfolio, as well as an international portfolio. The vertical axis measures the risk of a portfolio composed by *n* assets in relation to the risk of a domestic asset[5], while the horizontal axis measures the number of assets included in the portfolio. It is clear that the potential gains from international diversification are substantial. For the same number of assets included in the portfolio, the risk of an internationally diversified portfolio is about half of the risk of a domestically diversified portfolio.

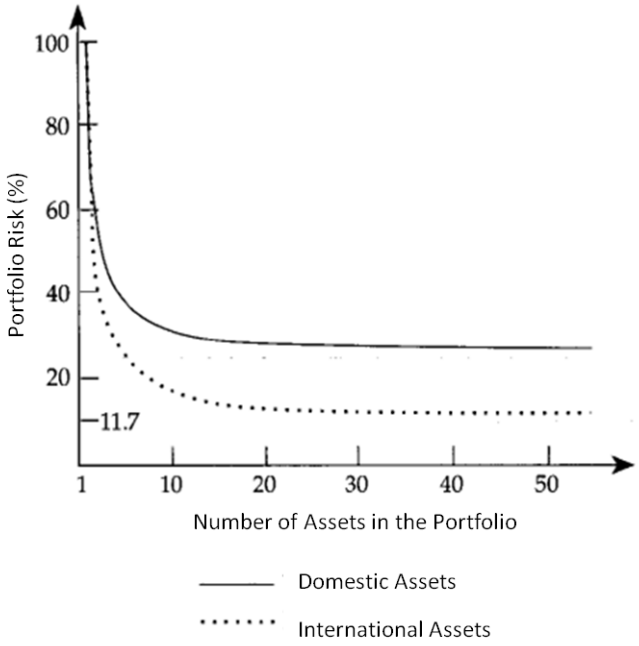

Figure 2.4: International diversification

Source: Adapted from Solnik (1974a)

More recent studies (e.g. Odier and Solnik 1993, De Santis and Gérard 1997) have shown that the structure of international correlations is still attractive for portfolio risk reduction.

[4] Recent empirical studies (e.g. Cavaglia, Brightman and Aked 2000; Baca, Garbe and Weiss 2000; Gérard, Hillion and De Roon 2002) suggest a growing importance of industry specific factors in relation to previous studies that suggested a clear dominance of country specific factors over industry specific factors in the explanation of the low correlation across national stock markets (e.g. Lessard 1973; Solnik and De Freitas 1988; Heston and Rouwenhorst 1994, 1995; Griffin and Karolyi 1998).

[5] The analysis is conducted by Solnik (1974a) for the U.S. market.

Moreover, although the main argument in favour of international diversification is portfolio risk reduction, it should be enhanced that international diversification also allows investors to improve portfolio risk-adjusted return through the expansion of the investment opportunity set. A low international correlation means that returns in different markets do not move in perfect synchrony and, therefore, an active investor can adjust the international asset allocation towards markets with superior expected returns, ensuring a superior risk-adjusted return of the portfolio (Solnik and McLeavey 2009). In fact, Odier and Solnik (1993) find that international asset allocation offers large potential gains in terms of risk-adjusted performance for investors of all major countries, this way supporting the results of previous studies (e.g. Gruble 1968, Levy and Sarnat 1970, Grauer and Hakansson 1987).

International diversification shifts the efficient frontier due to the enlarged investment opportunity set, allowing investors to simultaneously reduce the risk and increase the expected return of their portfolios (Shapiro 2000). Figure 2.5 illustrates the benefits of international diversification. The international efficient frontier is above and to the left of the domestic efficient frontier. International efficient portfolios B and B' offer a lower level of risk for the same level of expected return and a higher level of expected return for the same level of risk, respectively, than domestic efficient portfolio A. Thus, any of the international efficient portfolios (B and B') are preferable to the domestic efficient portfolio (A).

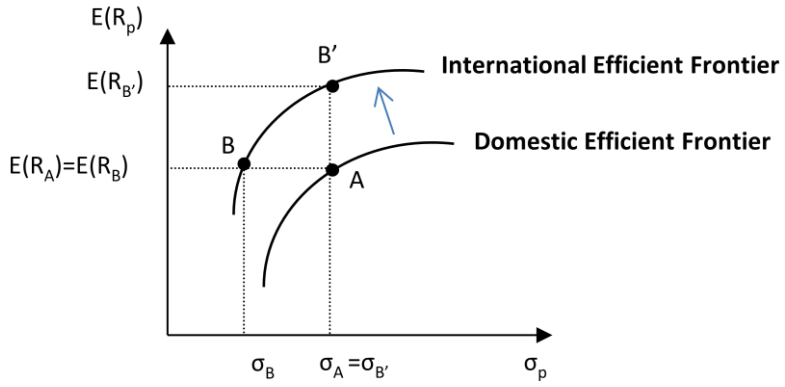

Figure 2.5: The international efficient frontier

In selecting the optimal international portfolio, investors will choose the optimal international portfolio located in the tangency point between the international efficient frontier and one of their indifference curves.

Figure 2.6 illustrates the optimal international portfolio selection. The optimal international portfolio of investors X and Y (X** and Y**, respectively) offer them a higher level of utility (i.e. lower risk and higher expected return) than the optimal portfolios they would choose in an exclusively domestic scenario (X* and Y*, respectively).

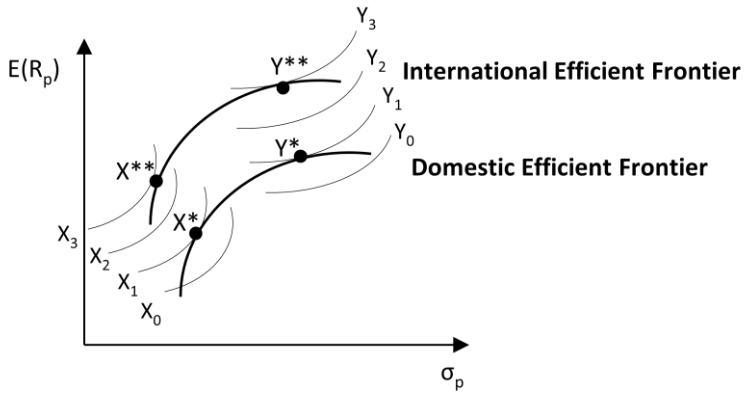

Figure 2.6: Optimal international portfolio selection

The consideration of the risk-free asset in the optimal international portfolio selection process, will lead investors to apply a proportion of their wealth in the world market portfolio[6] and the remaining in the risk-free asset, regardless of their level of risk aversion (Separation Theorem).

Figure 2.7 illustrates the optimal international portfolio selection in the context of a risk-free asset. The international portfolio of risky assets chosen by all investors is the world market portfolio (portfolio M*), which lies in the tangency point between the international efficient frontier and the corresponding CML (CML*). The optimal international portfolio chosen by investors, i.e., the combination between the risk-free asset and the world market portfolio that maximizes their utility, will lie in the tangency point between the CML* and their set of indifference curves. Note that the optimal international portfolio chosen by investors X and Y, X**and Y** respectively, lie in a higher indifference curve, corresponding to a higher level of utility (i.e. lower risk and higher expected return), in relation to the optimal portfolios they would choose in an exclusively domestic scenario (X* and Y*, respectively).

[6] Theoretically, the world market portfolio is comprised by all assets traded in the world market in proportions equal to the contribution of each asset to the world market capitalization.

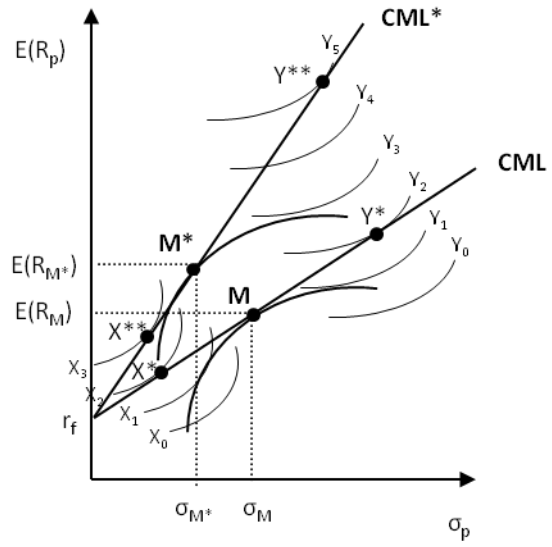

Figure 2.7: The Capital Market Line (CML) and optimal international portfolio selection

2.2.4 Arguments against the benefits of international diversification

There are, nonetheless, arguments against the benefits of international diversification.

First, exchange rate risk affects the return and the risk of foreign assets when both are measured in domestic currency. In fact, the return of a foreign asset in domestic currency is equal to the return of the foreign asset in foreign currency plus the variation in the spot exchange rate between the foreign and the domestic currencies (direct quote) plus their cross product. As the latter component is relatively small in relation to the former, it is often ignored, so the return of a foreign asset in domestic currency can be approximately written as in equation 2.5:

$$R_D = R_F + \Delta S + R_F.\Delta S \cong R_F + \Delta S \qquad \textbf{(2.5)}$$

where R_D and R_F represent the return of the foreign asset in domestic currency and in foreign currency, respectively, and ΔS the variation in the spot exchange rate.

The risk of the foreign asset in domestic currency, as measured by the standard deviation of the return of the foreign asset in domestic currency, is given by equation 2.6:

$$\sigma_{R_D} = \left(\sigma_{R_F}^2 + \sigma_{\Delta S}^2 + 2.\sigma_{R_F}.\sigma_{\Delta S}.\rho_{R,\Delta S}\right)^{\frac{1}{2}} \qquad \textbf{(2.6)}$$

where: $\sigma^2_{R_D}$ is the variance of the return of the foreign asset in domestic currency, $\sigma^2_{R_F}$ and σ_{R_F} are, respectively, the variance and the standard deviation of the return of the foreign asset in foreign currency, $\sigma^2_{\Delta S}$ and $\sigma_{\Delta S}$ are, respectively, the variance and the standard deviation of the spot exchange rate, and $\rho_{R,e}$ is the correlation coefficient between the return of the foreign asset in foreign currency and the spot exchange rate.

It follows that the risk of the foreign asset in domestic currency will always be less than the sum of the risk of the foreign asset in foreign currency (σ_{R_F}) and exchange rate risk ($\sigma_{\Delta S}$), unless the return of the foreign asset in foreign currency is perfectly positively correlated with the variations in the spot exchange rate (i.e., when $\rho_{R,\Delta S} = 1$). In fact, this correlation tends to be weak and even negative, so exchange rate risk cannot be totally added to the risk of the foreign asset (Solnik and McLeavey 2009).

As stated by Solnik and McLeavey (2009), the exchange rate risk is not an impediment to international investment for several reasons: 1) the contribution of exchange rate risk to portfolio risk tends to be small since the depreciation of a foreign currency is usually offset by the appreciation of another; 2) the contribution of exchange rate risk decreases with the length of the investment horizon, since exchange rates tend to revert to fundamentals over the long run (mean reversion); 3) exchange rate risk can easily be reduced or eliminated through currency derivatives such as forwards, futures and options.

Second, it has been argued that the benefits of international diversification are overstated, since markets are becoming increasingly integrated and thus synchronized. In fact, the international correlations have increased over the last decades. For instance, Longin and Solnik (1995) and Solnik, Boucrelle and Le Fur (1996) found a modest but significant increase in international correlations over the periods 1960-1990 and 1958-1994, respectively, possibly due to the progressive removal of impediments to international investment, as well as the growing political, economic and financial integration, which have strengthened the links between international markets. Goetzmann, Li and Rouwenhorst (2005) examined the correlation structure of the major world equity markets (France, Germany, United Kingdom and United States) from 1870 to 2000. They found that correlations varied considerably through time and that, due to increased international correlation, the current diversification benefits of international investments are relatively low compared with previous periods. More recently, Christoffersen, Errunza, Jacobs and Langlois (2012) found robust evidence that international correlations between stock markets have significantly increased during the 1973-2009 period, for both developed and emerging markets. In contrast, Bekaert, Hodrick and Zhang (2009) analysed the comovement in international stock returns of 23 countries during

the 1980-2005 period and found no evidence for an upward trend in return correlations, except for the European stock market.

Moreover, it has been documented that international correlations tend to increase in periods of high volatility or turbulence in financial markets[7], so the benefits of international diversification tend to disappear when they are needed the most[8]. However, this type of evidence may be simply the result of a statistical bias. Indeed, Loretan and English (2000) analysed the correlations of equity, bonds and exchange rates during various periods of market turbulence and concluded that the increase in correlations in periods of market turbulence may be just reflecting the increased volatility in markets returns. Forbes and Rigobon (2002, pp. 2249) also suggest that "test for contagion based on cross-market correlation coefficient are problematic due to the bias introduced by changing volatility in markets returns". After adjusting for this bias, they find that correlation does not increase significantly in periods of crisis.

Third, other factors may hinder international investment (e.g. regulations and capital controls, lack of familiarity with international markets) or decrease its benefits (e.g. taxation, transaction costs). These factors will be discussed in more detail further ahead.

2.3 Capital Asset Pricing Model (CAPM)

2.3.1 The CAPM

The CAPM, developed by Sharpe (1964), Linter (1965) and Mossin (1966), is based on quite restrictive assumptions, namely:

1) All investors are rational mean-variance optimizers;
2) Investments are limited to a universe of publicly traded financial assets, such as stocks and bonds, and there is unlimited risk-free borrowing and lending;
3) All investors plan for one identical holding period;
4) All investors have homogeneous expectations and beliefs;
5) Investors pay no taxes on returns and no transactions costs on asset trades.

[7] e.g. Bertero and Mayer (1990), King and Wadhwani (1990), King, Sentana and Wadhwani (1994), Longin and Solnik (1995), Karolyi and Stulz (1996), Kroner and Ng (1998) and Ramchad and Susmel (1998).

[8] As stated by Solnik and McLeavey (2009, pp. 410): "if all markets crash when your domestic market is crashing, there is little risk benefit to being internationally diversified".

These assumptions assure that all investors will derive the same efficient frontier. Given the existence of a risk-free asset, all investors will hold a combination of the risk-free asset and the market portfolio, regardless of their preferences towards risk and return (separation theorem).

The CAPM derives the equilibrium relationship between expected return and risk, based on the breakdown of total risk into systematic or market risk and nonsystematic or specific risk (Sharpe 1963). In so far as the latter can be reduced or eliminated through portfolio diversification, only the former is relevant for pricing capital assets.

Thus, according to the CAPM, the equilibrium expected return of an asset should be equal to the return on the risk-free asset plus a risk premium proportional to that asset's level of systematic or market risk, as shown in equation 2.7[9]:

$$E(R_i) = r_f + \beta_i . \left[E(R_m) - r_f\right] \quad \textbf{(2.7)}$$

where $E(R_i)$ is the expected return on asset *i*, $r_f$is the return on the risk-free asset, β_i is the beta coefficient of asset *i* and $E(R_m)$ is the expected return on the market portfolio.

The beta coefficient is measured by the ratio between the covariance of the asset's return with the market portfolio return and the variance of the market portfolio return, and is used to measure the sensitivity of the asset´s return to variations in the market portfolio return (i.e., market exposure). Assets with high beta coefficients are more sensitive to market movements (i.e., have higher systematic risk) and therefore should provide higher expected returns relative to assets with low beta coefficients.

2.3.2 The CAPM extended to the international context

Grauer, Litzenberger and Stehle (1976) extend the CAPM to the international context. According to this model, in equilibrium, all investors should hold a combination of the domestic risk-free asset and the world market portfolio (separation theorem) and the relationship between expected return and risk would be given by equation 2.8:

$$E(R_i) = r_f + \beta_{iw} . \left[E(R_w) - r_f\right] \quad \textbf{(2.8)}$$

[9] Equation 2.7 describes the Security Market Line (SML), which intercepts the axis of expected return at the level of the risk-free asset return and has a slope equal to the market risk-premium, i.e., the difference between the return on the market portfolio and the return on the risk-free asset. In equilibrium, the expected return of all assets should lie in the SML: assets with higher (lower) beta coefficients must have higher (lower) expected returns.

where $E(R_i)$ is the expected return on asset *i*, r_f is the return on the domestic risk-free asset, β_{iw} is the beta coefficient of asset *i*, which measures the sensitivity of asset *i* return to variations in the world market portfolio return, and $E(R_w)$ is the expected return on the world market portfolio.

The extension of the CAPM to the international context can only be achieved with the addition of two rather unrealistic assumptions: (1) investors of different countries have homogeneous preferences and identical consumption baskets; (2) real prices of consumption baskets are identical in different countries when measured in the same currency, for which purchasing power parity (PPP) must hold.

The PPP theory, originally developed by Cassel (1916), states that the spot exchange rate adjusts perfectly to inflation differentials between two countries (relative PPP), so that the price of a consumption basket is the same in both countries when measured in the same currency (absolute PPP). If the PPP holds then the real exchange rate is constant and there is no real exchange rate risk[10].

However, empirical evidence suggests that the PPP does not hold, at least in the short-run (Froot and Rogoff 1995). Deviations from the PPP imply variations in the real exchange rate, so the real price of consumption baskets e, consequently, consumption preferences may differ across countries.

2.3.3 The international CAPM

The international CAPM, developed by Solnik (1974b), Sercu (1980) and Adler and Dumas (1983), assumes the possibility of deviations from the PPP. The international CAPM is constructed under the additional assumption that investors care about the expected return and risk measured in their domestic currency and, since deviations of PPP are allowed, investors will want to hedge against real exchange rate risk. They can do so by freely borrowing and lending in any currency. It follows the Separation Theorem, according to which all investors will hold a combination of the risk-free asset in their domestic currency and the world market portfolio optimally hedged against foreign currency risk. The international CAPM does not provide, however, information on the optimal currency-hedge ratios[11].

The equilibrium relationship between expected return and risk resulting from the international CAPM is clearly more complex than the previous versions where only one source

[10] A review of the PPP theory may be found in Rogoff (1996).

[11] The hedge ratio is the proportion of the value of the portfolio that is hedged against exchange rate risk. For further developments on this issue see Black (1989, 1990).

of risk was accounted for. In the presence of exchange rate risk, additional risk premiums must be considered in order to compensate investors for the sensitivity of asset returns to variations in the spot exchange rates. Hence, the equilibrium expected return on an asset depends on the world market risk premium plus *K* foreign currency risk premiums, as shown in equation 2.9:

$$E(R_i) = r_f + \beta_{iw}.\left[E(R_w) - r_f\right] + \sum_{k=1}^{K} \gamma_{ik}.SRP_k \qquad \textbf{(2.9)}$$

where: $E(R_i)$ is the equilibrium expected return on asset *i*, r_f is the return on the domestic risk-free asset, β_{iw} is the sensitivity of asset *i* return to variations in the world market portfolio returns, $E(R_w)$ is the expected return on the world market portfolio, γ_{ik} is the sensitivity of the asset *i* return to variations in the exchange rate of foreign currency *k*, SRP_k is the foreign currency risk premium (or spot risk premium) on foreign currency *k*. All returns are measured in domestic currency.

The foreign currency risk premiums are, by definition, equal to the expected variation in the spot exchange rate minus the differential between the domestic and the foreign risk-free rates. Using the covered interest rate parity approximation[12], the foreign currency risk premiums can also be expressed as the difference between the expected spot and the forward exchange rates in percentage of the current spot exchange rate, as shown in equation 2.10:

$$SRP_k = \frac{E(S) - S}{S} - \left(r_f - r_{fk}\right) = \frac{E(S) - S}{S} - \frac{F - S}{S} = \frac{E(S) - F}{S} \qquad \textbf{(2.10)}$$

where: SRP_k is the foreign currency risk premium on foreign currency k, $E(\mathrm{S})$ is the expected spot exchange rate, S is the current spot exchange rate, F is the forward exchange rate, r_{fk} is the return of the foreign risk-free asset, and r_f is the return of the domestic risk-free asset.

Thus, only unanticipated changes in spot exchanges rates, i.e., changes that cannot be anticipated by interest rate differential or by forward exchange rate, should be compensated with a risk premium.

[12] According to the covered interest rate parity, the forward premium (discount) on the foreign currency must approximately equal the differential between the domestic and the foreign risk-free rate.

2.4 Home and Foreign Biases

2.4.1 Definition

The international CAPM advocates that, in equilibrium, all investors should hold, as the optimal portfolio of risky assets, the world market portfolio, which theoretically is composed by all assets traded in the world market in proportion to their contribution to the world market capitalisation.

However, despite the increasing deregulation, liberalisation and integration of financial markets and the subsequent increase in international portfolio investment in the last decades, several empirical studies have shown evidence that the portfolio held by investors substantially differs from the world market portfolio as suggested by the international CAPM. In fact, in relation to the optimal portfolio weights of the international CAPM, investors tend to overweight domestic assets (home bias) and underweight foreign assets in their portfolios (foreign bias)[13].

French and Porteba (1991) presented the first study on the home bias phenomenon. They studied international equity holdings in the five largest stock markets in 1989 and showed that the proportion of domestic holdings was highly disproportionate in relation to theoretical predictions, namely: 92,2% in United States, 95,7% in Japan, 92% in United Kingdom, 79% in Germany and 84,4% in France. These findings indicate that investors exhibit a preference (reluctance) towards holding domestic (foreign) assets, despite the highly favourable international correlation structure for portfolio international diversification.

In turn, Cooper and Kaplanis (1994) show evidence of home bias in eight markets (France, Germany, Italy, Japan, Spain, Sweden, United Kingdom and United States) in 1987. Tesar and Werner (1995) also observe a significant home bias in five OECD countries (Canada, Germany, Japan, UK and United States), during the period 1970-1990. The home bias is still severe nowadays (e.g. Faruqee, Li e Yan 2004), despite the trend towards increasing international diversification and the reduction of the home and foreign biases, especially in developed countries (e.g. Amadi 2004a, Baele, Pungulescu and Horst 2007, Ferreira and Miguel 2007, Sercu and Vanpee 2007).

The foreign bias phenomenon, although receiving much less attention, is also documented by Chan, Covrig and Ng (2005) and Ferreira and Miguel (2007, 2011).

[13] The home bias phenomenon reflects the extent to which investors overweight domestic assets in their portfolios, while the foreign bias reflects the extent to which investors underweight or overweight foreign assets (Chan, Covrig and Ng 2005, Ferreira and Miguel 2007).

2.4.2 Explaining the Home and Foreign Biases

The intriguing home and foreign biases phenomena have attracted the attention of academics in recent years, in an attempt to explain this apparently irrational behaviour of investors: why do they bias their portfolios towards domestic assets when they could make significant gains through international diversification? Numerous studies have attempted to provide theoretical explanations for the lack of international diversification of investors' portfolios. Sercu and Vanpee (2007) identify five main theories: (i) domestic risk hedging; (ii) direct and indirect barriers to international portfolio investment; (iii) information costs; (iv) transparency and corporate governance; and (v) behavioural biases.

2.4.2.1 Domestic risk hedging

A first potential explanation for the home bias is that domestic assets serve as a better hedge for domestic specific risks (Lewis 1999), namely inflation risk (e.g. Adler and Dumas 1983) and the risk from non-tradable wealth components in financial markets, such as human capital (e.g. Brainard and Tobin 1992, Bottazzia, Pesentib and Van Wincoop 1996, Baxter and Jermann 1997, Coen 2001, Julliard 2002) and non-financial income (e.g. Massa and Simonov 2006).

The models of Stulz (1981a) and Adler and Dumas (1983) suggest that, due to deviations from the PPP, investors in different countries are induced to hold portfolios that differ by a component designed to hedge inflation risk. These models could only serve as an explanation for the home bias if domestic assets were held in order to hedge domestic inflation risk. However, it is only possible to hedge inflation risk with domestic assets if inflation rates and domestic asset returns are positively correlated. Empirical evidence for a positive correlation between inflation rate and domestic asset returns is weak (e.g. Adler and Dumas 1983, Cooper and Kaplanis 1994, De Moor, Sercu and Vanpee 2010), indicating that inflation risk hedging cannot explain the observed home bias.

A second source of domestic specific risks that could potentially explain the home bias is related to the risk of non-tradable wealth components in financial markets. Indeed, the CAPM assumes that wealth is perfectly liquid and tradable, so that, in practice, the world market portfolio is composed by equities and bonds, not incorporating other non-tradable wealth components, among which is human capital. Such omitted wealth components may explain the home bias if investors intentionally hold more domestic assets in their portfolios as a way

to diversify the risk of non-tradable wealth. For this purpose, the return on non-tradable wealth should be negatively correlated with the return on domestic assets. However, Massa and Simonov (2006) show that the correlation between the return on non-tradable wealth and the return on investors' portfolio is positive and higher than the correlation between the return on non-tradable wealth and the return on the market portfolio. Thus, the market portfolio would better hedge the risk of non-tradable wealth than the portfolio actually held by investors. They therefore conclude that hedging the risk of non-tradable wealth fails as an explanation for the home bias.

Other studies focus on the particular case of human capital (Brainard and Tobin 1992, Bottazzia, Pesentib and Van Wincoop 1996, Baxter and Jerman 1997, Coen 2001, Julliard 2002). The majority of these studies support the conclusion of Massa and Simonov (2006), as they find a positive relationship between the return on human capital and the return on domestic assets. For example, Baxter and Jermann (1997) show that the return on human capital is more correlated with the return on domestic assets than on foreign assets. To properly hedge the risk of human capital, investors should hold an even higher proportion of foreign assets in their portfolios than that suggested by the international CAPM, which would make the home bias even more severe. In contrast, Bottazzia, Pesentib e Van Wincoop (1996) and Julliard (2002) find evidence of a negative relationship between the return on human capital and domestic assets, suggesting that hedging the risks of human capital can potentially explain the home bias phenomenon.

Nonetheless, none of the studies that consider domestic risk hedging as an explanation for the home bias provide truly convincing results (Sercu and Vanpee 2007), so domestic risk hedging cannot explain *per se* the scant international diversification. Another possible explanation for the home bias is that international investments entail costs that outweigh the benefits of international diversification.

2.4.2.2 Barriers to international portfolio investment

A second potential explanation for the home bias is related to the direct and indirect barriers to international portfolio investment.

Some authors suggest that the home bias may be the result of direct barriers to international portfolio investment, such as capital controls and capital market regulations. Both capital controls and capital market regulations are intended to restrain capital flows. While capital controls specifically restrain capital inflows and outflows (e.g. limitations on the foreign ownership in national corporations or on the amount of capital a domestic investor

may spend on foreign assets), capital market regulations are more subtle (e.g. restrictions on the issuance of securities in national capital markets by foreign entities). Both can severely constraint international portfolio investment.

Black (1974), Stulz (1981b) and Errunza and Losq (1985) show that in the presence of barriers to international investment investors tend to overweight domestic assets in their portfolios. At the time, it was not unrealistic to assume that direct barriers could explain the home bias in portfolios. However, since the early nineties, there has been a slow but general relaxation of these constraints worldwide. In fact, there are now few existing barriers to international investment, especially in developed countries, and they are not prohibitive nor sufficiently high to explain the home bias. Thus, although they may have been important in the past, the prevailing direct barriers to international investment are not binding enough to explain the equity home bias (Uppal 1992).

Some authors suggest that the home bias may be the result of indirect barriers to international portfolio investment, such as taxation and transaction costs. Taxation on international portfolio investment applies to transactions, capital gains and income (dividends, interest, etc.). Among these, income taxes (or withholding taxes) are the main obstacle to international portfolio investment, since they often create a double taxation problem[14]. International tax treaties among countries play a crucial role in reducing or even eliminating double taxation problems, since they allow the income tax paid in the investment country to be creditable to the income tax paid in the home country. However, tax credits are limited and burdened with delays and administrative costs. Therefore, taxation can deter international portfolio investment. This might explain why off-shore financial centres (or tax heavens) have attracted significant flows of international portfolio investment. On the other hand, transaction costs (e.g. bid-ask spreads, management fees, brokerage commissions, exchange rate transaction costs, price impact of trade[15]), although varying considerably across countries, tend to be higher for foreign than for domestic investment, and therefore may contribute to the home bias.

Nevertheless, the indirect barriers to international portfolio investment have not gained empirical support as an explanation for the home bias. Cooper and Kaplanis (1986, 1994) and French and Porteba (1991) estimate that in order to explain the observed home bias the level

[14] In fact, most countries have now eliminated or drastically reduced their international transaction taxes. Capital gains are normally taxed in the investor's home country, regardless of the origin of the investment. Since income on foreign investment is paid by a resident of one country to a resident of another country, both countries may want to impose a tax on that income, thereby creation double taxation problems (Solnik 2000).

[15] The *price impact of trade* is the difference between the price at which the transaction occurred and the price that would have prevailed if the transaction had not occurred. For a more detail analysis see Domowitz, Glen and Madhavan (2001).

of taxes would have to be much higher than that investors actually face. Tesar and Werner (1995) suggest that transaction costs also cannot be a reasonable explanation for the observed home bias, since they find turnover rates[16] to be higher on foreign than on domestic portfolios. In fact, if trading in foreign assets is more expensive, one would expect a smaller amount of transactions in foreign assets than in domestic assets and not the other way around. Warnock (2002) suggests that this underweighted but overtraded puzzle in foreign assets could be due to the intrinsic problems in estimating the cross-border holdings based on capital flow data. Taking this into account, he finds turnover rate to be similar for foreign and domestic portfolios, even though he also concludes that transaction costs fail as an explanation for the home bias.

Thus, direct and indirect barriers to international portfolio investments are also not able to provide per se an explanation for the home bias.

2.4.2.3 Information costs

A third potential explanation to the home bias relates to information costs.

According to the information costs theory, investors are better informed on the risk-return characteristics of domestic assets relative to foreign assets and therefore they perceive the latter as more risky than the former. This induces risk-averse investors to overweight domestic assets in their portfolios, thereby explaining the home bias. As stated by Gehrig (1993, pp. 98), "investors may on average be better informed about the risk return characteristics of domestic stocks. Hence, foreign investments appear on average more risky and investors rationally bias their portfolios towards the less risky domestic assets".

The models of Merton (1987), Zhou (1998) and Brennan and Cao (1997) suggest that information costs induce the home bias.

Merton (1987) developed an equilibrium model with incomplete information in which investors only have information on a subset of available assets and therefore only that subset is considered when constructing their portfolios. As a consequence, in equilibrium, investors hold sub-diversified portfolios. Since information differs across investors, the subset of assets considered as well as the resulting portfolio also differs across investors.

The model of Zhou (1998) shows that information costs may explain the home bias since investors tend to bias their portfolios towards the asset on which they have superior

[16] The turnover rate is the percentage share of holdings bought or resold in a period of time.

information (i.e., domestic assets) because superior information results in lower conditional variance of asset returns (i.e., lower risk).

Brennan and Cao (1997) developed a model in which domestic and foreign investors are endowed with different levels of information. Both receive public and private information: public information is equally received by domestic and foreign investors, while private information is better received by domestic investors. The model suggests that, since domestic investors have an informational advantage over foreign investors on domestic assets, the latter tend to buy (sell) assets with high (low) past return. Brennan, Cao, Strong and Xu (2005) confirm the results of Brennan and Cao (1997) by empirically showing that the investment of foreign investors is positively correlated with past market returns. Such result is consistent with an informational disadvantage of foreign investors. The model provides an explanation for the return chasing behaviour documented in several studies (e.g. Bohn and Tesar 1996; Froot, O'Connell and Seasholes 2001).

Some authors argue that the influence of information costs on the home bias depends on specific investor characteristics. For instance, Kang and Stulz (1997) suggest that the sinking costs of learning about foreign assets deter many investors below a certain level of wealth. Vissing-Jorgensen (2004) show that wealthier investors are more likely to invest in foreign assets, which is consistent with the idea that wealthier investors are more capable of supporting the higher information costs of international investment. Bailey, Kumar and Ng (2008) show that wealthier and more experienced investors are more likely to pay the fixed costs of learning, to efficiently obtain and process the information and, consequently, to invest in foreign assets.

Other authors argue that the influence of information costs on the home bias also depends on the characteristics of the traded asset. For instance, Gehrig (1993) compares the equity and bond portfolios of Deutsch and Swiss banks, and shows that the home bias is higher in equity than in bond portfolios. According to Gehrig (1993), this finding is more consistent with the explanations of the home bias based on information costs rather than those based on exchange rate risk and transaction costs: "the stronger bias for equity is easily accounted for by the fact that the informational requirements for valuing equities are much larger than for valuing bonds" (Gehrig, 1993, pp. 101), so "the assumption of an informational advantage of domestic investors is more likely to hold for equity holders than for bond holders" (Gehrig, 1993, pp. 106).

The information costs theory has gained support in the recent empirical literature (e.g. Al-Khail 2003, Faruqee, Li and Yan 2004, Mishra 2007, Lane and Milesi-Ferretti 2008).

2.4.2.4 Transparency and corporate governance

The fourth potential explanation for the equity home bias phenomenon is related to transparency and corporate governance. According to this theory, the lack of transparency at the country level (e.g. corruption, political risk), as well as weak levels of corporate governance (e.g. poor national accounting standards and practices, lack of legal protection of minority shareholders), can deter investors from investing abroad and, therefore, explain the lack of foreign diversification of investors' portfolios.

Gelos and Wei (2005) analyse how country transparency affects mutual fund international equity investment. They find clear evidence that mutual funds tend to hold more (less) assets from more (less) transparent countries. Moreover, they find that mutual funds have a greater propensity to exit nontransparent countries during crisis, i.e., less transparent countries tend to suffer larger outflows during crisis. Similarly, Gande and Parsley (2010) address the response of equity mutual fund flows to sovereign rating changes in 85 countries from 1996-2002 and find that while improvements in a country's sovereign rating are not associated with significant changes in equity flows, sovereign downgrades are strongly associated with outflows of capital from the downgraded country, with more transparent countries experiencing smaller outflows.

Dahlquist, Pinkowitz, Stulz and Williamson (2003) show that differences in corporate governance practices across countries can help explain the home bias: controlling shareholders, who are typically domestic investors, hold a part of the corporation's shares such a way that only a small fraction of the issued shares can be freely traded and held by foreign investors. In the same line of research, Giannetti and Simonov (2006) show that the quality of corporate governance in a company affects the amount of its shares bought and held by investors. Domestic investors can extract substantial private benefits from companies with poor corporate governance. Foreign investors typically do not enjoy private benefits from companies with poor corporate governance and, therefore, they will avoid investing in these companies in order to minimize expropriation risks. In fact, La Porta, Lopez-de-Silanes and Shleifer (1999) find that a company ownership is more internationally dispersed in countries with good legal protection of minority shareholders. Pagano, Randl, Röell and Zechner (2001) and Ahearne, Griever and Warnock (2004) underline that the information costs for foreign investors are much higher in companies with poor accounting practices, weak corporate governance and lack of protection of minority shareholders.

The theory based on transparency and corporate governance has also found some support in more recent empirical studies (e.g. Gelos and Wei 2005, Aggarwal, Klapper and

Wysocki 2005), although the effects of variables proxing for transparency and corporate governance are, in general, less significant than those proxing for information costs.

2.4.2.5 Behavioural biases

Finally, the behavioural-based explanations attribute the home bias to investor-specific behavioural bias, such as familiarity (Huberman 2001), recognition (Goldstein and Gigerenzer 1999, Boyd 2001), patriotism (Morse and Shive 2011), optimism (Kilka and Weber 2000, Strong and Xu 2003) and overconfidence (Odean 1999, Barber and Odean 2000, 2001, 2008).

To explain the home bias phenomenon some authors have developed behavioural models based on familiarity. Huberman (2001) shows that the home bias is a consequence of investors' preference for holding assets they are more familiar with. He argues that investors are, by nature, more familiar with domestic assets and feel a general sense of discomfort or even fear towards foreign assets. Huberman (2001) also shows that investors' preference for what is familiar is not an exclusive behaviour of the average investor, but it is also revealed by more sophisticated investors. Ackert, Church, Tompkins and Zhang (2005) also show that investors have higher perceived familiarity with domestic, rather than foreign, securities, thereby investing more in domestic securities. Coval and Moskowitz (1999) and Ivkovic and Weisbenner (2005) present evidence of a familiarity bias due to geographic proximity. Grinblatt and Keloharju (2001) also suggest that investors exhibit a preference for the assets of nearby firms with the same language and culture.

The distinction between familiarity and information costs is, however, ambiguous. For instance, several authors use geographical proximity as a proxy for information costs, while others as a measure of familiarity. Ke, Ng and Wang (2010) suggest that the preference for physically proximate investments is driven by familiarity rather than information asymmetries. In contrast, Massa and Simonov (2006) argue that familiarity-driven investment decisions are a rational response to information constraints, rather than a behavioural bias. They find that familiarity mostly affects less informed investors, thereby concluding that the more sophisticated the investor is, the weaker is the effect of familiarity on decision-making. De Marzo, Kaniel and Kremer (2004) find that the impact of familiarity depends on the degree to which the investor is informed: more informed investors are less affected by familiarity. In fact, Graham, Harvey and Huang (2009) show that more competent investors are more likely to invest in international assets. Grinblatt and Keloharju (2001), Goetzmann and Kumar (2004) and Karlsson and Norden (2007) also suggest that less sophisticated and experienced investors are more home-biased than more sophisticated and experienced investors.

Other authors suggest that investors are more likely to invest in assets of domestic companies because they are recognizable (Goldstein and Gigerenzer 1999, Boyd 2001). Goldstein and Gigerenzer (1999) argue that the investment decision based on recognition may lead to good results if investors are more likely to recognize a company with good performance, i.e., if recognition is correlated with corporate performance. However, Boyd (2001) demonstrates that investment decisions based on recognition works poorly when that correlation is low.

More recent streams in the literature propose explanations for home bias based on patriotism (Morse and Shrive 2011), optimism (Kilka and Weber 2000, Strong and Xu 2003) and overconfidence (Odean 1999, Barber and Odean 2000, 2001, 2008). Morse and Shrive (2011) argue that patriotism causes investors to concentrate their asset holdings at home. Using a sample of 53 countries, they find that measures of patriotism are significantly related to the home bias, even after controlling for diversification benefits, capital controls, information costs and familiarity. Kilka and Weber (2000) and Strong and Xu (2003) find that investors tend to be more optimistic towards the domestic market than towards international markets, resulting in a superior investment in domestic than in foreign assets. Odean (1999), Barber and Odean (2000, 2001, 2008), among others, argue that overconfident investors have a perceived information advantage concerning the investments they are familiar with. Hence, they tend to misjudge their ability to forecast the expected returns of familiar assets and to overinvest in the assets they are familiar with (Barber and Odean 2001, 2002, Karlsson and Norden 2007).

Behavioural-based explanations have also gained some support in empirical studies, especially familiarity.

2.5 Gravity models in the context of international portfolio investment

Gravity-models are largely used to explain international trade and foreign direct investment patterns. The basic empirical specification of gravity-models explains international bilateral linkages by the origin and destination countries size and the geographical distance between them, in a log-linear form. The basic model is then extended to incorporate additional explanatory variables. Martin and Rey (2004) provide a theoretical framework for the application of gravity-models in the analysis of international portfolio investment.

The two-country general equilibrium model of Martin and Rey (2004) is based on three basic assumptions: (1) assets are imperfect substitutes because they entail different levels of risk; (2) investors with different levels of risk-aversion select different assets and, hence, the number of assets traded on markets is proportional to the number of investors in the country;

(3) cross-border investment flows entails some transaction and information costs, which affect negatively the price and demand of assets.

Consider two countries, the home country i and foreign country j, populated with n_i and n_j agents (i.e., investors), respectively. Consider a representative agent of country i, h_i. At time t, the representative agent of country i, h_i, is endowed with y_{h_i} units of tradable good (i.e., the numéraire) which he can choose to consume or invest in a set of risky projects (i.e., risky assets). The total number of risky projects developed by agent h_i is z_{h_i}. The cost of developing a new risky project is a differentiable function $f(z_{h_i})$ with $f'(z_{h_i}) > 0$ and $f''(z_{h_i}) > 0$, i.e., the cost of developing a new risky project increases with number of risky projects developed by agent h_i and the marginal cost of developing a new risky project is also increasing with the number of risky projects already developed by agent h_i.

Agent h_i can sell a portion $\alpha_{h_i}^i$ of each risky project developed by himself at price $p_{h_i}^i$. If each risky project developed by agent h_i pay a dividend at time $t+1$, then agent h_i will receive $d.(1-\alpha_{h_i}^i)$ for the portion of each risky project he kept to himself.

Agent h_i can also demand risky projects developed by other agents in country i (other than h_i). Let p_i be the price of a risky project developed by an agent in country i (other than h_i) and $s_{h_i}^i$ be the demand of agent h_i for that risky project. Then the amount paid by agent h_i to purchase such risky project is $p_i.s_{h_i}^i$. If the risky project pays a dividend at time $t+1$, then agent h_i will receive $d.s_{h_i}^i$ for each risky project he purchased.

Agent h_i can also demand risky projects developed by agents from country j. Let p_j be the price of a risky project developed by an agent country j, $s_{h_i}^j$ be the demand of agent h_i for that risky project and τ_i^j be the transaction cost that agent h_i must pay to buy that foreign risky project ($\tau_i^j > 0$). Then, the amount paid by agent h_i to purchase such a risky project is given by $p_j.s_{h_i}^j.(1+\tau_i^j)$. If the risky project pays a dividend at time $t+1$, then agent h_i will receive $d.(1-\tau_i^j)$ for each risky project he purchased, since a transaction cost also applies to dividends earned in a foreign country.

Different assets entail different levels of risk and therefore assets are imperfect substitutes, making diversification desirable.

The budget constraint of agent h_i can be therefore expressed as in equation 2.11:

$$y_{h_i} + \sum_{i=1}^{z_{h_i}} \alpha_{h_i}^i.p_{h_i}^i = c_{h_i,t} + f(z_{h_i}) + \sum_{\substack{i=1 \\ i\neq h_i}}^{n_i} p_i.s_{h_i}^i + \sum_{j=1}^{n_j} p_j.s_{h_i}^j.(1+\tau_i^j) \quad \textbf{(2.11)}$$

where y_{h_i} is the initial endowment of agent h_i; $\sum_{i=1}^{z_{h_i}} \alpha_{h_i}^{i}.p_{h_i}^{i}$ is additional endowment due to the portion $\alpha_{h_i}^{i}$ of each risky project developed by agent h_i sold at price $p_{h_i}^{i}$; $c_{h_i,t}$ is the consumption of agent h_i at time t; $f(z_{h_i})$ is the cost agent h_i bears to develop a new risky project; $\sum_{\substack{i=1 \\ i\neq h_i}}^{n_i} p_i.s_{h_i}^{i}$ is the cost of the risky projects developed by other agents in country i and demanded by agent h_i; and $\sum_{j=1}^{n_j} p_j\,.s_{h_i}^{j}.(1+\tau_i^j)$ is the cost of the risky projects developed by agents in country j and demanded by agent h_i.

At time $t+1$, there are S different states of the world, each with identical probability of occurring (i.e., $1/S$). Each risky project can be considered as an Arrow-Debreu asset because it only pays in one state of the world. There are no intermediary income streams such as labour income, so that the dividends are the unique source of consumption next period.

Thus, the expected utility of agent h_i depends on his consumption at time t, as well as the expected consumption at time t+1 given the future dividend on the risky assets he holds, each with equal probability of occurring ($1/S$), and can be expressed as in equation 2.12:

$$E[U_{h_i}] = c_{h_i,t} + \delta.E\left[\frac{\left(c_{h_i,t+1}\right)^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}}\right] \qquad \textbf{(2.12)}$$

where $E[U_{h_i}]$ is the expected utility of agent h_i; $c_{h_i,t}$ is the consumption of agent h_i at time t; and $\delta.E\left[\frac{\left(c_{h_i,t+1}\right)^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}}\right]$ is the expected consumption of agent h_i at time t+1, which depends on his degree of risk aversion ($1/\sigma$), discounted at rate δ.

Agent h_i will maximise his expected utility (equation 2.12), subject to his budget constraint (equation 2.11). From the first-order conditions, the individual demand for risky projects traded in country i and in country j can be expressed by equations 2.13 and 2.14, respectively:

$$s_{h_i}^{i} = \left(\frac{\delta}{S}\right)^{\sigma}.d^{\sigma-1}.p_i^{-\sigma} \qquad \textbf{(2.13)}$$

$$s_{h_i}^{j} = \left(\frac{\delta}{S}\right)^{\sigma}.d^{\sigma-1}.p_j^{-\sigma}.\frac{\left(1-\tau_i^j\right)^{\sigma-1}}{\left(1+\tau_i^j\right)^{\sigma}} \qquad \textbf{(2.14)}$$

Thus, the aggregate demand of risky projects from country j by agents of country i, can be expressed as in equation 2.15:

$$Y_i^j = n_i.s_{h_i}^j.n_j.p_j = n_i.\left(\left[\left(\frac{\delta}{S}\right)^{\sigma}.d^{\sigma-1}.p_j^{-\sigma}.\frac{\left(1-\tau_i^j\right)^{\sigma-1}}{\left(1+\tau_i^j\right)^{\sigma}}\right]\right).n_j.p_j \quad \textbf{(2.15)}$$

By applying logarithms and rearranging, the equation above can be written as in equation 2.16:

$$log\left(Y_i^j\right) = \sigma.log\left(\frac{\delta}{S}\right) + log\left(n_i.n_j\right) + (\sigma-1).log\left(r_j\right) - \log\left(\theta_i^j\right) \quad \textbf{(2.16)}$$

with $r_j = d/p_j$and $\theta_i^j = \left(1-\tau_i^j\right)^{\sigma-1}/\left(1+\tau_i^j\right)^{\sigma}$.

Equation 2.16 shows a theoretical gravity-style relationship on bilateral international portfolio investment of origin country i in destination country j. The first term is a constant. The second term corresponds to origin and destination countries size. The third term reflects the return on destination country assets. Finally, the last term stands for transaction and information costs.

Martin and Rey (2004) suggest the use of population or GDP as a proxy for size. It is believed that GDP is a better proxy for size than population. In fact, countries with higher GDP will tend to offer (demand) more assets to (from) other countries. This is not so obvious with population, particularly when one thinks of developing countries. Other measures have been used as the size variable, specifically market capitalization and per capita GDP. Martin and Rey (2004) also suggest the use of geographical distance as a measure for transaction and information costs since Portes and Rey (2005) find that transaction and information costs on international portfolio investment are well proxied by geographical distance. As stated by Portes and Rey (2005), transaction and information costs should be positively correlated with distance as the cost of travelling and calling is higher, cultural differences are stronger and business links are weaker for longer distances. In fact, the use of geographical distance to measure transaction and information costs has become a common practice in empirical studies on the determinants of international portfolio investment. The next section will address these measurement issues in detail.

The Martin and Rey (2004) model, described above, provided an inestimable contribution to the literature in this area, and it has been used as the theoretical support of many empirical studies on the determinants of international portfolio investment (e.g., Faruqee, Li and Yan 2004, Portes and Rey 2005, Aviat and Coeurdacier 2007, Diyarbakirlioglu 2011) with highly successful results.

2.6 Prior research on the determinants of international portfolio investment

2.6.1 Typology of empirical studies

The home and foreign bias phenomena provides strong evidence that there are other factors, besides expected return and risk, determining international portfolio investment. Recent empirical studies try to provide some evidence on the determinants of international portfolio investment. Such studies differ on the basis of the sample and variables selected. In respect to the sample considered, empirical studies can be classified according to several criteria, such as: (1) the type of asset under analysis; (2) the type of investor considered; (3) the investment origin and destination countries selected; and (4) the period of investment under analysis.

Table 2.1 classifies extant empirical studies according to these criteria.

According to the type of asset under analysis, the majority of empirical studies focus on the determinants of international equity investment (e.g. Lane and Milesi-Ferretti 2008), although it is also possible to find studies that focus on the determinants of international bond investment (e.g. Ferreira and Miguel 2011), as well as studies that focus on the determinants of both international equity and bond investment (e.g. Aggarwal, Kearney and Lucey 2012).

According to the type of investor considered, the majority of empirical studies focus on aggregate data for all investors in one or more investment origin countries (e.g. Lane and Milesi-Ferretti 2008), this way implicitly assuming that different types of investors within a country have homogeneous preferences. It is also possible to find empirical studies that focus on disaggregate data for one particular type of investor in one or more investment origin countries, such as mutual funds (e.g. Chan, Covirg and Ng 2005) and households (Bailey, Kumar e Ng 2008). In this respect, both types of studies are limited since they do not allow the comparison of the determinants of international portfolio investment between different types of investors.

Table 2.1: Classification of empirical studies on the determinants of international portfolio investment

This table classifies the empirical studies on the determinants of international portfolio investment according to several criteria. The classification criteria are presented in the first and second columns, while empirical studies are presented in the third column.

Classification Criteria		Empirical Studies
Type of Asset	Equity	Diyarbakirlioglu 2011; Lane and Milesi-Ferretti 2008; Bailey, Kumar and Ng 2008; Berkel 2007; Ferreira and Miguel 2007; Mishra 2007; Pendle 2008; Aggarwal, Klapper and Wysocki 2005; Chan, Covrig and Ng 2005; Amandi 2004b; Bertaut and Kole 2004; Faruqee, Li and Yan 2004; Al-Khail 2003
	Bond	Ferreira and Miguel 2011
	Equity and Bond	Aggarwal, Kearney and Lucey 2012; Forbes 2010; Daude and Fratzscher 2008; Coeurdacier and Martin 2007; De Santis and Gérard 2006; Mishra and Daly 2006; Kyrychenko and Shum 2006; Portes, Rey and Oh 2001; Honohan and Lane 2000
Type of Investor	All	Aggarwal, Kearney and Lucey 2012; Diyarbakirlioglu 2011; Forbes 2010; Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Berkel 2007; Ferreira and Miguel 2007, 2011; Mishra 2007; Pendle 2008; Coeurdacier and Martin 2007; De Santis and Gérard 2006; Mishra and Daly 2006; Amandi 2004b; Bertaut and Kole 2004; Faruqee, Li and Yan 2004; Al-Khail 2003; Portes, Rey and Oh 2001; Honohan and Lane 2000
	Mutual Funds	Aggarwal, Klapper and Wysocki 2005; Chan, Covrig and Ng 2005
	Households	Bailey, Kumar and Ng 2008; Kyrychenko and Shum 2006
Investment Origin and Destination Countries	One Origin Country Several Destination Countries	**Australia** (Mishra 2007; Pendle 2008; Mishra and Daly 2006); **Finland** (Al-Khail 2003); **Ireland** (Honohan and Lane 2000); **USA** (Bailey, Kumar and Ng 2008; Kyrychenko and Shum 2006; Aggarwal, Klapper and Wysocki 2005)
	One Destination Country Several Origin Countries	**Finland** (Liljeblom and Löflund 2005); **Japan** (Kang and Stulz 1997) **Portugal** (Monteiro and Manso 2009); **USA** (Forbes 2010)
	Several Origin Countries Several Destination Countries	Aggarwal, Kearney and Lucey 2012; Diyarbakirlioglu 2011; Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Berkel 2007; Ferreira and Miguel 2007, 2011; Mishra 2007; Coeurdacier and Martin 2007; De Santis and Gérard 2006; Chan, Covrig and Ng 2005; Amandi 2004b; Bertaut and Kole 2004; Faruqee, Li and Yan 2004; Al-Khail 2003
Year of Investment	One Year	**1997** (Faruqee, Li and Yan 2004; Al-Khail 2003; Honohan and Lane 2000); **2001** (Lane and Milesi-Ferretti 2008; Coeurdacier and Martin 2007; Aggarwal, Klapper and Wysocki 2005; Amandi 2004b; Bertaut and Kole 2004); **2006** (Diyarbakirlioglu 2011)
	More Than One Year	**1997 and 2001** (Berkel 2007; De Santis and Gérard 2006; Mishra and Daly 2006); **1999 and 2000** (Chan, Covrig and Ng 2005); **1997, 2001 and 2002** (Mishra 2007; Ferreira and Miguel 2007, 2011); **2001, 2002 and 2003** (Daude and Fratzscher 2008); **1992, 1995, 1998, 2001 and 2004** (Kyrychenko and Shum 2006); **1991 to 1996** (Bailey, Kumar and Ng 2008); **2001 to 2005** (Pendle 2008); **2001 to 2006** (Forbes 2010); **2001 to 2007** (Aggarwal, Kearney and Lucey 2012)

According to the investment origin and destination countries selected, it is possible to distinguish studies that simultaneously consider several investment origin and destination countries (e.g. Aggarwal, Kearney and Lucey 2012), from studies that consider only one investment origin country and several destination countries (e.g. Bailey, Kumar and Ng 2008) or only one investment destination country and several origin countries (e.g. Forbes 2010).

According to the period of investment under analysis, it is possible to distinguish studies that focus on one specific year of investment (e.g. Diyarbakirlioglu 2011) from studies that consider simultaneously several years of investment (e.g. Aggarwal, Kearney and Lucey 2012).

Furthermore, empirical studies on the determinants of international portfolio investment also differ with respect to the measures used to assess international portfolio investment as well as its determinants.

Table 2.2 summarizes the most commonly used measures in these studies.

With regard to the measures used to assess international portfolio investment, it is possible to distinguish empirical studies that use: international portfolio flows (e.g. Portes and Rey 2005); international portfolio holdings[17] (e.g. Aggarwal, Kearney and Lucey 2012); international portfolio weights (e.g. Berkel 2007); portfolio home bias (e.g. Ferreira and Miguel 2007, 2011); and portfolio foreign bias (e.g. Ferreira and Miguel 2007, 2011).

In respect to the determinants of international portfolio investment several measures have been used to assess the benefits and the constraints of international portfolio investment mentioned in the literature, namely: destination country risk diversification potential and return; the size, development and openness of investment origin and/or destination countries; the barriers to international portfolio investment; information costs and familiarity between origin and destination countries; and transparency and corporate governance in destination country.

To evaluate the risk diversification potential the majority of empirical studies use the return correlation coefficient. In fact, according to portfolio theory, lower return correlation coefficients offer greater potential for portfolio risk diversification and, therefore, investors should invest more in assets with lower correlation coefficients. However, this measure, although widely used, suffers from some limitations (Ferreira and Miguel 2007). First, return correlation coefficients vary substantially over time, so different estimation strategies based on different window and data frequencies may yield substantially different results. Second, periods of high volatility in financial markets may contribute to overestimate the return correlation coefficients, distorting the long-run diversification potential (Bekaert, Harvey and Ng 2005). Third, return correlation coefficients may simply be a measure of financial market integration (Bekaert and Wang 2009). Given these limitations, other measures have been proposed to evaluate the risk diversification potential, namely the correlation coefficient between the GDP growth rates, industry concentration and specific risk.

[17] In some of these studies, international portfolio holdings are estimated using accumulated capital flows and valuation adjustments (e.g. Cooper and Klapanis 1994, Tesar and Werner 1995, Bekaert and Harvey 2000). However, as shown by Lane (2000), Warnock (2002) and Warnock and Cleaver (2003), aggregate capital flow data is ill suited to estimate bilateral holdings, as the foreign country identified in capital flows data is that of the intermediary, not the issuer of the security. Thus, when intermediary and issuer countries differ, as is often the case in asset trade through financial centres, capital flows data will produce distorted holdings estimates.

Table 2.2: Most commonly used measures in empirical studies on the determinants of international portfolio investment

This table presents the most common measures used in empirical studies on the determinants of international portfolio investment. The category of each variable as well as the most commonly used measures within each category are presented in the first and second columns, respectively, while empirical studies are presented in the third column.

Category	Variable	Empirical Studies
International Portfolio Investment	Portfolio Flows	Portes and Rey 2005; Martin and Rey 2004
	Portfolio Holdings	Diyarbakirlioglu 2011; Aggarwal, Kearney and Lucey 2012; Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Mishra 2007; Coeurdacier and Martin 2007; Faruqee, Li and Yan 2004
	Portfolio Weights	Berkel 2007; De Santis and Gérard (2006); Amandi 2004b; Al-Khail 2003
	Home Bias	Ferreira and Miguel 2007, 2011; Chan, Covrig and Ng 2005; Bertaut and Kole 2004; Pendle 2008
	Foreign Bias	Ferreira and Miguel 2007, 2011; Chan, Covrig and Ng 2005; Bertaut and Kole 2004
Risk Diversification	Return Correlation	Diyarbakirlioglu 2011; Lane and Milesi-Ferretti 2008; Berkel 2007; Ferreira and Miguel 2007, 2011; Mishra 2007; Pendle 2008; Amandi 2004b; Faruqee, Li and Yan 2004
	GDP Growth Rate Correlation	Lane and Milesi-Ferretti 2008; Mishra 2007
	Industry Concentration	Ferreira and Miguel 2007
	Specific Risk	Lane and Milesi-Ferretti 2008; Al-Khail 2003
Return	Return	Diyarbakirlioglu 2011; Ferreira and Miguel 2007, 2011; Coeurdacier and Martin 2007; Amandi 2004b; Faruqee, Li and Yan 2004
	Sharpe Ratio	Diyarbakirlioglu 2011; Lane and Milesi-Ferretti 2008; Pendle 2008; Al-Khail 2003
Size	GDP	Diyarbakirlioglu 2011; Mishra 2007; Coeurdacier and Martin 2007; Faruqee, Li and Yan 2004
	GDP Growth Rate	Aggarwal, Kearney and Lucey 2012
	Market Capitalisation	Ferreira and Miguel 2007; Pendle 2008; Bertaut and Kole 2004
	Market Capitalisation over GDP	Ferreira and Miguel 2007, 2011; Amandi 2004b
Development	GDP	Lane and Milesi-Ferretti 2008
	per capita GDP	Diyarbakirlioglu 2011; Lane and Milesi-Ferretti 2008; Mishra 2007; Ferreira and Miguel 2007, 2011; Al-Khail 2003
	GDP Growth Rate	Berkel 2007; Ferreira and Miguel 2007, 2011; Al-Khail 2003
	Market Capitalisation	Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Mishra 2007
	Market Capitalisation over GDP	Aggarwal, Kearney and Lucey 2012; Berkel 2007; Coeurdacier and Martin 2007; Bertaut and Kole 2004
	Political Risk	Aggarwal, Kearney and Lucey 2012
	Sovereign Credit Rating	Ferreira and Miguel 2007, 2011
	Financial Centre	Lane and Milesi-Ferretti 2008; Coeurdacier and Martin 2007; De Santis and Gérard 2006
	Emerging Market	Ferreira and Miguel 2007, 2011
Openness	Trade	Mishra 2007
	Trade over GDP	Diyarbakirlioglu 2011; Ferreira and Miguel 2007; Amandi 2004b
	FDI over GDP	Diyarbakirlioglu 2011; Ferreira and Miguel 2007
Barriers	Capital Controls	Lane and Milesi-Ferretti 2008; Berkel 2007; Ferreira and Miguel 2007, 2011; Mishra 2007; Pendle 2008; Amandi 2004b
	Withholding Taxes	Ferreira and Miguel 2007
	Tax Treaty	Lane and Milesi-Ferretti 2008
	Transaction Costs	Amandi 2004b; Bertaut and Kole 2004;
	Telephone Call Costs	Mishra 2007; Faruqee, Li and Yan 2004

Table 2.2 (continued)

Category	Variable	Empirical Studies
Information Costs and Familiarity	Geographical Distance	Diyarbakirlioglu 2011; Aggarwal, Kearney and Lucey 2012; Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Berkel 2007; Ferreira and Miguel 2007, 2011; Pendle 2008; Coeurdacier and Martin 2007; Amandi 2004b; Bertaut and Kole 2004; Faruqee, Li and Yan 2004; Al-Khail 2003
	Cultural Distance	Diyarbakirlioglu 2011; Aggarwal, Kearney e Lucey 2012
	Bilateral Trade	Diyarbakirlioglu 2011; Lane and Milesi-Ferretti 2008; Ferreira and Miguel 2007, 2011; Coeurdacier and Martin 2007; De Santis and Gérard 2006; Bertaut and Kole 2004; Faruqee, Li and Yan 2004; Al-Khail 2003
	Bilateral FDI	Al-Khail 2003
	Bilateral Migration	Daude and Fratzscher 2008; Foad 2008, Amadi 2004b
	Contiguity	Amandi 2004b
	Geographical Region	Diyarbakirlioglu 2011; Coeurdacier and Martin 2007
	Common Language	Diyarbakirlioglu 2011; Aggarwal, Kearney and Lucey 2012; Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Ferreira and Miguel 2007, 2011; Mishra 2007; Pendle 2008; Coeurdacier and Martin 2007; Amandi 2004b; Bertaut and Kole 2004; Faruqee, Li and Yan 2004; Al-Khail 2003
	Common Currency	Lane and Milesi-Ferretti 2008; Coeurdacier and Martin 2007; De Santis and Gérard 2006; Amandi 2004b
	Common Religion	Aggarwal, Kearney e Lucey 2012
	Common Legal System Origin	Diyarbakirlioglu 2011; Aggarwal, Kearney and Lucey 2012; Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Berkel 2007; Mishra 2007; Coeurdacier and Martin 2007
	Colonial Links	Daude and Fratzscher 2008; Lane and Milesi-Ferretti 2008; Berkel 2007
Transparency and Corporate Governance	Corruption	Diyarbakirlioglu 2011; Daude and Fratzscher 2008; Coeurdacier and Martin 2007; De Santis and Gérard 2006; Al-Khail 2003
	Judicial System Efficiency	Ferreira and Miguel 2007, 2011;Pendle 2008; Al-Khail 2003
	Legal System	Ferreira and Miguel 2007, 2011;Pendle 2008
	Investors Protection	Diyarbakirlioglu 2011; Aggarwal, Kearney and Lucey 2012; Ferreira and Miguel 2007
	Expropriation Risk	Daude and Fratzscher 2008; Ferreira and Miguel 2007 ; Al-Khail 2003
	Accounting Standards	Daude and Fratzscher 2008; Ferreira and Miguel 2007; Pendle 2008
	Financial Reporting Quality	Daude and Fratzscher 2008; Bertaut and Kole 2004

To assess return most empirical studies use the average return on the market index of the investment destination country. Other measures, such as the Sharpe ratio (Sharpe 1966), are also used, although less frequently.

The size and development of the investment origin and/or destination country is usually measured by GDP, GDP growth rate, market capitalisation or the ratio of market capitalisation over GDP. Other measures are also considered to evaluate the development of the investment origin and/or destination country, namely political or country risk (normally measured by the International Country Risk Guide index), the sovereign credit rating, and dummies for financial centre and emerging market. Some empirical studies also consider the openness of the investment origin and/or destination country by including trade (exports plus imports) or the ratio between trade and GDP or between FDI and GDP.

To assess the direct barriers to international portfolio investment, namely capital controls, empirical studies tend to use the capital control index from the Economic Freedom Network. This index measures the restrictions that countries impose on international capital flows, with lower ratings being attributed to countries with higher restrictions on international capital flows (e.g. Chan, Covrig and Ng 2005, Ferreira and Miguel 2007). Alternatively, some empirical studies use the ratio between the market capitalisation of the Investable Index and of the Global Index, both from International Finance Corporation, in order to evaluate the percentage of the financial market that is not subject to foreign ownership restrictions (e.g. Bekaert 1995, Edison and Warnock 2003, Bekaert and Wang 2009) or one minus this ratio to directly assess the percentage of the financial market that is restricted to foreign ownership (e.g. Ahearne, Griever and Warnock 2004, Amadi 2004b). On the other hand, to evaluate the indirect barriers to international portfolio investment, namely taxes and transaction costs, empirical studies tend to use the withholding tax rate and/or a dummy to account for the existence of an international tax treaty and the transaction costs index, provided by Elkins-McSherry Co., that aggregates commissions, fees and the price impact of trade, or the cost per minute of an international telephone call during working hours.

To evaluate information costs and familiarity between investment origin and destination countries, several measures have been used. The most frequently used measure is the geographical distance between investment origin and destination countries, which curiously has proven to be a quite reasonable measure of information costs. Recently, some authors (e.g. Diyarbakirlioglu 2011, Aggarwal, Kearney and Lucey 2012) have also considered cultural distance, based on the five cultural dimensions proposed by Hofstede (2001): power distance, individualism, masculinity, uncertainty avoidance and long-term orientation. Bilateral trade between investment origin and destination countries is also frequently used, since bilateral trade may contribute to increase the intensity of information flows between countries (Al-Khail 2003). On the same grounds, some authors also consider bilateral FDI and bilateral migration. It is also common to consider a set of dummies for geographical contiguity, same geographical region, common language, common currency, common religion, common legal system origin and colonial links, among others.

To assess the transparency at the country level empirical studies frequently use the corruption indices, either provided by Transparency International, International Country Risk Guide or World Bank. It is also common to consider indices for the efficiency of the legal system, provided by the Business International Corporation or the World Bank or constructed on the basis of the measures of La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998), as well as a dummy for legal system origin, since legal systems based on common law tend to provide

a better legal protection to investors than legal systems based on civil law. In turn, to assess the quality of corporate governance and/or investors protection, several measures have been used, namely: the protection of minority shareholders index, developed by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997); the expropriation risk index, provided by the International Country Risk Guide; the accounting standards index, developed by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998) or by the International Country Risk Guide; and the quality of information disclosure index, provided by the World Bank.

Differences in the samples and in the selected independent variables make the results of different empirical studies hardly comparable. Nevertheless, in what follows, the evidence of the main empirical studies on the determinants of international portfolio investment is reviewed.

2.6.2 Empirical evidence

Empirical studies on the determinants of international portfolio investment have increased considerably in recent years, mostly due to the disclosure of data on international portfolio investment holdings of several countries by the Coordinated Portfolio Investment Survey (CPIS), conducted by the International Monetary Fund (IMF).

This section provides a review of the main empirical studies on the determinants of international portfolio investment that make use of CPIS dataset, namely those that provide cross-country evidence, i.e., that consider simultaneously several investment origin and destination countries. Attention is devoted to the empirical studies that focus on: (1) the determinants of international equity investment; (2) the determinants of international bond investment; and (3) the determinants of both international equity and bond investment.

2.6.2.1 Determinants of international equity investment

The majority of cross-country studies on the determinants of international equity investment that make use of CPIS dataset tend to focus the analysis on one particular year. This is the case of Al-Khail (2003) and Faruqee, Li and Yan (2004), for the year 1997, Amandi (2004b), Bertaut and Kole (2004) and Lane and Milesi-Ferretti (2008), for the year 2001, and Diyarbakirlioglu (2011), for the year 2006. With two or more years of analysis, it is possible to find the studies of Berkel (2007), for the years 1997 and 2001, and of Mishra (2007) and Ferreira and Miguel (2007), for the years 1997, 2001 and 2002.

Al-Khail (2003) analyses the determinants of international equity investment for 29 countries, at the end of 1997. International equity investment is measured by the proportion of equity assets held by each origin country in each destination country. As explanatory variables, he considers: (1) the characteristics of the investment destination country, such as the size and performance of the equity market, as well as variables associated to the economic, financial and legal environment[18]; (2) characteristics that are unique to each pair origin-destination countries, such as distance, common language and intensity of trade and FDI, that proxy for transaction and information costs. He also controls for investment origin country per capita GDP.

Regarding the first set of variables, the results show that the size of destination country equity market, as measured by its weight on world market capitalisation, exerts a dominant influence, whereas the influence of destination country economic, financial and legal environment is only residual. For the second set of variables, the results show that international equity investment is significantly affected by distance, common language and intensity of trade and FDI. These results are consistent with the relevance of market size, as well as transaction and information costs, for international equity investment. Al-Khail (2003) underlines that trade and FDI can significantly contribute to reduce information costs and, therefore, enhance international equity investment.

Faruqee, Li and Yan (2004) analyse the determinants of international equity investment holdings of 20 origin countries into 29 destination countries, at the end of 1997, using an extended version of Martin and Rey (2004)'s gravity-model. As dependent variable they use the value of each destination country equities held by each origin country at the end of 1997. Alternatively, they also consider that value adjusted by market capitalisation of both origin and destination countries. The independent variables are, in turn, divided into six groups: (1) the size of both origin and destination countries, measured by GDP; (2) information costs variables, such as geographical distance between capital cities of origin and destination countries, common language and the number of telephone lines in both origin and destination countries; (3) transaction costs variables, such as the cost of an international telephone call from origin country to destination country; (4) the average real annual return on destination country; (5) the correlation between average real annual return on origin and destination countries, to proxy for the risk diversification potential; and (6) bilateral trade of goods and services (exports plus imports) between origin and destination countries adjusted for GDP.

[18] The economic variables include the GDP growth rate and the per capita GDP. The political and legal variables include indicators for judicial system efficiency, corruption, expropriation risk as well as corporate governance indices.

The results suggest that the size of both origin and destination countries, as well as transaction and information costs, are the main determinants of international equity holdings. In fact, international equity holdings are found to be positively and significantly affected by the size of both origin and destination countries, common language, the number of telephone lines in origin country and intensity of trade, and negatively and significantly affected by distance and telephone costs. The results also support financial theory, as holdings are higher in destination countries with higher returns and higher risk diversification potential.

Amandi (2004b) analyses the effect of familiarity on the degree of international diversification of equity portfolios of more than 30 countries in 2001. The degree of international diversification is measured by the ratio between the value of destination country equity held by origin country and the total value of equity held by origin country, which is estimated by equity market capitalisation plus international equity assets minus international equity liabilities of origin country. The effect of familiarity on the degree of international diversification of equity portfolios is accounted for by the following variables: the degree of openness to international trade, geographical distance, geographical contiguity, common language, monetary union, and immigrations links between origin and destination countries. The effect of familiarity on the degree of international diversification of equity portfolios is controlled by the inclusion of potentially relevant variables, such as the relative size of destination country financial market, the difference and the correlation between the returns in origin and destination countries, international investment restrictions and transaction costs in the destination country.

The results suggest that familiarity plays a significant role on the degree of international diversification of equity portfolios, particularly the openness to international trade, common language and immigration, which corroborates the important role of information costs in international investment.

Additionally, this study shows that the relative size of destination country equity market and the difference and the correlation between the returns in origin and destination countries, used as control variables, are also significant determinants of the degree of international diversification[19]. In contrast, monetary union, restrictions and transactions costs are not significant.

Bertaut and Kole (2004) analyse the determinants of home and foreign bias in equity portfolios of 31 countries, in 2001. The authors observe that all equity portfolios are home biased and that the degree of home bias varies across countries. Particularly, the degree of

[19] Curiously, the correlation coefficient between the returns on origin and destination countries is positive, contradicting the motivation for portfolio risk diversification.

home bias tends to be more pronounced in the equity portfolios of developing and emerging countries, and less pronounced in the equity portfolios of developed countries, especially Nordic countries. The authors also document the existence of foreign bias. On the one hand, countries tend to overweight equities from other countries, namely those with which they have close regional ties (e.g. Nordic countries tend to overweight equities of other Nordic countries; euro-area countries overweight equities of other euro-area countries). On the other hand, countries tend underweight equities of other countries. For instance they find that, surprisingly, all countries underweight US equities in their portfolios.

To analyse the determinants of home and foreign bias Bertaut and Kole (2004) use, as dependent variable, the ratio between the weight of destination country equities in the equity portfolio of origin country and the weight of destination country in the world market capitalisation. As independent variables they consider variables that are specific to each pair origin-destination country (e.g. bilateral trade, geographical distance, common language and number of destination country equities listed in origin country stock exchange) and other variables (e.g. size and development of destination country equity market, market concentration, transaction costs and accounting disclosures index).

The results suggest that an increase in bilateral trade and a reduction in geographical distance between origin and destination countries contribute significantly to reduce the home and foreign bias. Cross-listing also helps to reduce the home and foreign bias. Therefore, the authors conclude for the importance of recognition and familiarity in reducing both home and foreign bias.

Lane and Milesi-Ferretti (2008) analyse the determinants of international equity holdings of 67 origin countries into approximately 200 destination countries, at the end of 2001, based on an N-country generalisation of the Obstfeld and Rogoff (2001) model. Empirically, the authors attempt to isolate the relative effect of three groups of variables: (1) characteristics of investment origin country; (2) characteristics of investment destination country; (3) bilateral factors. To evaluate the characteristics of both investment origin and destination countries, they consider: GDP; per capita GDP; market capitalisation; a capital control index; a dummy for financial centre; Sharpe ratio; market risk; and specific risk. As bilateral factors, they consider: geographical distance; time difference; a set of dummies for common language, colonial ties, monetary union, tax treaty, and common legal system origin; correlation between market returns of origin and destination countries; correlation between GDP growth rates of origin and destination countries; correlation between origin country GDP growth rate and destination country market returns; exchange rate volatility; and average imports of destination country by origin country.

Their findings show that international equity holdings are significantly determined by bilateral factors proxing for information costs, namely time difference, common language, common legal system origin and bilateral trade, as well as proxing for risk diversification potential, such as the correlation between market returns[20] and between GDP growth rates of origin and destination countries. The authors also document that countries with higher per capita GDP, with more developed and less volatile financial markets invest more in international equities, especially in those from countries with more developed financial markets.

Using an extended gravity-model, Diyarbakirlioglu (2011) examines whether the effect of geographical distance on the pattern of international equity holdings is explained by the intensity of information or by cultural affinities between countries. She considers, as dependent variable, the international equity holdings of 24 origin countries, at the end of 2006. As independent variables, she considers the size of both origin and destination countries and the geographical distance between them, as well as two variables proxing for information distance and cultural distance between origin and destination countries. As control variables she considers several measures to proxy for: (1) economic development (per capita GDP of both origin and destination country, financial market sophistication, investor protection); (2) openness to international trade; (3) familiarity (bilateral trade, common language, common legal system origin, common region); (4) transparency (Corruption Perception index); (5) diversification motive (return and risk-adjusted return of destination country market index; correlation coefficient between origin and destination countries market indices).

The results suggest that the negative effect of geographical distance on the pattern of international equity holdings is explained by information distance rather than cultural distance between countries. The size, economic development and the transparency of destination country also play an important role in explaining international equity holdings patterns. The results also suggest the importance of bilateral trade in reducing information costs between origin and destination countries and, thereby, in increasing international equity holdings. Curiously, the results do not support the motivation for risk diversification, nor the return chasing behaviour, since international equity holdings are found to be positively affected by the correlation between origin and destination countries market returns and negatively affected by the risk-adjusted market return of destination country. Diyarbakirlioglu (2011) considers this empirical evidence as a robust proof that information costs are vital to understand the international equity holdings patterns.

[20] As in Amandi (2004b), the correlation between market returns is positive, thus contradicting the motivation for risk diversification.

Berkel (2007) analyses the determinants of international equity portfolio weights (i.e., the weight of destination country equity in origin country international equity portfolio) of 38 origin countries, at end of years of 1997 and 2001. As potential determinants, she considers: financial market development, international capital controls, information costs, return and risk diversification potential. The results show that financial market development, as measured by market capitalisation scaled by GDP and banking system credit scaled by GDP, positively affects international equity portfolio weights. The substantial impact of financial market development on international equity portfolio weights is, however, less important than the impact of information costs, as measured by geographical distance, common legal system origin and colonial ties. In contrast, international capital controls (measured by a capital control index and a dummy for financial crisis), as well as the risk diversification potential (measured by origin and destination countries market returns correlation), are not significant in determining international equity portfolio weights. The return potential, as measured by destination country average GDP growth rate, also plays a positive and significant role in determining international equity portfolio weights.

Mishra (2007) examines the characteristics of both origin and destination countries and the bilateral factors that affect international equity holdings at the end of years 1997, 2001 and 2002. To evaluate the characteristics of both origin and destination countries he considers the following variables: size (measured by GDP), development (measured by per capita GDP), market capitalisation, international trade and international capital controls. To evaluate the bilateral factors he considers: telephone call costs, common language, common legal system origin, as well as the correlation between GDP growth rates and between market index returns.

The results show that international equity holdings are strongly affected by information costs (such as telephone call costs) and by cultural and institutional proximity (such as common language and common legal system origin). The results also show that investors exhibit a preference for equities from countries with which they trade and with similar characteristics, in particular coordinated business cycles and correlated market returns[21].

Ferreira and Miguel (2007) investigate the determinants of home and foreign bias in equity portfolios of 42 countries, at the end of years 1997, 2001 and 2002. Home bias is measured by the ratio between the weight of origin country equity holdings invested domestically and the weight of origin country in world market capitalisation. In turn, foreign bias is measured by the ratio between the weight of each destination country in origin country

[21] As in Amandi (2004b) and Lane and Milesi-Ferretti (2008), the correlation coefficient between the returns on origin and destination countries is positive.

equity holdings and the weight of destination country in world market capitalisation. As potential determinants of home and foreign bias the authors propose a set of variables related to industrial concentration, economic development, international capital controls, the size and development of stock markets, familiarity, investors protection, and other variables.

Industrial concentration is considered to capture more precisely the potential of international diversification. Two measures of industrial concentration are considered: the first measures how much a country industry weight deviates from that of the world, increasing as the country becomes more concentrated in few industries in relation to world; the second measures how much the origin country industrial concentration deviates from destination country industrial concentration, increasing with larger industrial concentration differences between origin and destination countries (and thus larger diversification potential). Economic development is captured by per capita GDP, GDP growth rate, trade scaled by GDP, FDI scaled by GDP and country credit rating. International capital controls is measured by the International Capital Markets Control index, from the Economic Freedom of the World, that measures the restrictions countries impose on capital flows, by assigning lower ratings to countries with more restrictions on foreign capital transactions. To measure the absolute and relative size of the stock market Ferreira and Miguel (2007) use the market capitalisation of listed companies and the market capitalisation scaled by GDP, respectively. In turn, stock market development is measured by turnover ratio, transaction costs and a dummy for emerging market. Familiarity is assessed by common language, geographical distance and bilateral trade. Investor protection is evaluated by five indices for rule of law, accounting standards, antidirector rights, risk of expropriation and efficiency of the judicial system, as well as a dummy for legal system origin. Other variables include past one-year returns and past five-year returns, the correlation between origin and destination countries returns, and the average withholding tax.

As in Bertaut and Kole (2004), Ferreira and Miguel (2007) present evidence of home and foreign biases in all equity portfolios. The degree of home and foreign biases is found to be more severe in countries with less developed stock markets. With respect to the determinants of home and foreign biases, the results indicate that these are positively affected by industrial concentration, suggesting that investors prefer to invest in destination countries with different industrial concentration, which means that they do care about diversification when investing internationally. The results also suggest that economic development, international capital controls, size and development of the stock market and familiarity are significant determinants of home and foreign biases.

Overall, empirical evidence tends to support the importance of destination country market size and development in the determination of international equity investment (e.g. Al-Khail 2003, Amandi 2004b, Faruquee, Li and Yan 2004, Berkel 2007, Lane and Milesi-ferreti 2008), as well as in the reduction of the home and foreign biases (e.g. Ferreira and Miguel 2007). Information costs and familiarity are also main determinants of international equity investment, especially geographical distance, bilateral trade and common language (e.g. Al-Khail 2003, Bertaut and Kole 2004, Faruquee, Li and Yan 2004, Berkel 2007). The importance of transparency and corporate governance, namely the quality of the legal system and investor protection, is also documented by Ferreira and Miguel (2007). Empirical evidence on the determinants of international equity investment also tends to support the return-chasing behaviour of investors (e.g. Amandi 2004b, Faruquee, Li and Yan 2004), while tends to contradict the motivation for portfolio risk diversification (e.g. Amandi 2004b, Mishra 2007, Lane and Milesi Ferreti 2008).

2.6.2.2 Determinants of international bond investment

Empirical studies on the determinants of international bond investment are scarce in relation to those on the determinants of international equity investment. The study of Ferreira and Miguel (2011) focuses specifically on the determinants of international bond investment and, therefore, is here reviewed.

Ferreira and Miguel (2011) investigate the determinants of home and foreign biases in bond portfolios of 42 countries, at the end of years 1997, 2001 and 2002. Home bias is measured by the ratio between the weight of origin country bond holdings invested domestically and the weight of origin country in world market capitalisation. In turn, foreign bias is measured by the ratio between the weight of each destination country in origin country bond holdings and the weight of destination country in world market capitalisation. As potential determinants of home and foreign biases the authors propose a set of variables related to economic development, international capital controls, size and development of bond markets, familiarity, investors protection, and other variables.

Economic development is captured by per capita GDP, GDP growth rate, and country credit rating. International capital controls is measured by the International Capital Markets Control index, from the Economic Freedom of the World, that measures the restrictions countries impose on capital flows and assigns lower ratings to countries with more restrictions on foreign capital transactions. To measure the size and development of the bond market they use the market value of the bond market scaled by GDP and a dummy for emerging market.

Familiarity is assessed by common language, geographical distance and bilateral trade. Investor protection is evaluated by the efficiency of the judicial system index and a dummy for legal system origin. Other variables include past three-year bond returns and the correlation between origin and destination countries bond returns.

Ferreira and Miguel (2011) present evidence of home and foreign biases in all bond portfolios. The results show that home bias in bond portfolios is lower in more economically developed countries, with more developed bond markets, fewer international capital controls and higher efficiency of the judicial system. Countries with higher bond market past returns and higher bond return correlation with the rest of the world exhibit higher degree of home bias. Interestingly, familiarity does not seem to be important in explaining the degree of home bias.

The results on foreign bias show that investors prefer to hold bonds from more economically developed countries, with more developed bond markets, fewer international capital controls and higher efficiency of the judicial system. Investors also exhibit a preference towards bonds of more familiar countries, namely those that are geographically near and that share the same language, and towards bonds with higher past returns. Finally, there is no evidence that bond holdings are explained by diversification opportunities, when these are measured by the correlation between origin and destination countries bond past returns.

2.6.2.3 Determinants of international equity and bond investment

Among the empirical studies that analyse the determinants of both equity and bond investment, and therefore set the conditions for a comparison of those determinants between assets, the study of Coeurdacier and Martin (2007), that focuses on one single year of analysis, and the studies of De Santis and Gérard (2006), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012), that focus on several years of analysis, stand out.

Coeurdacier and Martin (2007) investigate, using a simplified version of Martin and Rey (2004)'s gravity-model, the determinants of international equity and bond holdings of 61 origin countries at the end of year 2001. As dependent variables they use: destination country size (proxied by GDP); destination country market sophistication (proxied by market capitalisation scaled by GDP); transaction and information costs (proxied by geographical distance, bilateral trade, transparency of destination country, common language and common legal system origin); and destination country returns (proxied by the average monthly returns on the stock

market index[22] over the period 1990-2001). The authors also control for the impact of euro in international holdings by using two dummies: a dummy that takes the value one when both origin and destination countries are members of euro zone; and a dummy that takes the value one when destination country is a member of euro zone. They also control for the impact of European Union, off-shores, financial centres and geographical region.

The results suggest that international equity holdings are significantly determined by the size and sophistication of destination country equity market, as well as by transaction and information costs. International equity holdings are also significantly higher between euro zone countries, in euro zone destination countries (when origin country is not from euro zone) and in off-shore destination countries. The returns on destination country stock market index and the dummy for being a financial centre do not significantly affect international equity holdings.

In turn, international bond holdings are significantly determined by the size of destination country bond market, as well as by transaction and information costs, namely geographical distance, bilateral trade and transparency. International bond holdings are also significantly higher between euro zone countries and in euro zone destination countries (when origin country is not from euro zone). The return on destination country stock market index and financial centre dummy do not significantly affect international bond holdings. The sophistication of destination country bond market, as well as the dummies for common language, common legal system origin, financial centre and off-shores do not significantly affect international bond holdings.

Regarding the differences in the determinants of holdings between assets, the results of Coeurdacier and Martin (2007) suggest that the size and sophistication of destination country financial market, as well as information costs, namely bilateral trade, common language and common legal system origin, are more important in the determination of equity than bond holdings. In contrast, the effect of geographical distance on international bond holdings is almost twice its effect on international equity holdings. This is a surprising result. Distance has proven to be a good proxy for information costs (Portes, Rey and Oh 2001, Portes and Rey 2005) and, as such, should affect less international bond holdings since the information requirements for valuing bonds are lower than for equities (Gehrig 1993, Portes, Rey and Oh 2001). The effect of the euro is also stronger on international bond holdings than on international equity holdings. According to Coeurdacier and Martin (2007), this result is not surprising since the contribution of exchange rate risk to total risk is higher for bonds than for

[22] The authors do not include bond returns.

equities. The effect of destination country transparency is also stronger on international bond holdings than on international equity holdings.

De Santis and Gérard (2006) investigate the determinants of international equity and bond holdings of 30 countries, at the end of years 1997 and 2001. The dependent variable is the variation in international portfolio weights from 1997 to 2001. As dependent variables they consider: (1) the degree of portfolio diversification, as measured by the difference between actual and optimal portfolio weights; (2) diversification benefits, as measured by the decrease in portfolio risk due to changes in portfolio weights; and (3) asset returns. They control for the impact of euro in international holdings by using two dummies: a dummy that takes the value one when both origin and destination countries are members of the euro zone; and a dummy that takes the value one when destination country is a member of the euro zone. As control variables they use bilateral trade, populating aging and corruption in the destination country.

The results suggest that changes in equity portfolio weights from 1997 and 2001 were significantly determined by the degree of portfolio diversification, diversification benefits, European Monetary Union (EMU) membership and bilateral trade. In turn, changes in bond portfolio weights were significantly determined by the degree of portfolio diversification, diversification benefits, destination country bond returns, EMU membership, bilateral trade and destination country transparency. The authors note that the effects of these variables tend to be stronger for bonds than equities.

Daude and Fratzscher (2008) analyse and compare the determinants of international equity and bond holdings[23] of 77 industrial and emerging countries. The dependent variable is the average of international equity and bond holdings from 2001 to 2003. As independent variables, the authors consider three groups of variables: (1) information costs, as measured by geographical distance and a set of dummies for common language, common legal system origin, colonial links and trade agreement; (2) the degree of market openness and development, as measured by a dummy for capital account liberalization, stock market capitalisation and credit to the private sector; (3) the quality of economic and political institutions, as measured by transparency, investor protection and corruption.

Regarding the influence of information costs, the results suggest that international equity holdings are negatively and significantly affected by geographical distance and trade agreements between origin and destination countries, and positively and significantly affected

[23] In this study, the authors compare the determinants of FDI, international equity securities, international debt securities and banking loans.

by common language, common legal system origin and colonial links. In turn, international bond holdings are negatively and significantly affected by geographical distance and positively and significantly affected by common legal system origin and trade agreements between origin and destination countries. In terms of the differences between both types of assets, the results suggest that the effect of geographical distance and trade agreement between origin and destination countries on international holdings is significantly stronger for bonds than for equities. In contrast, common language, common legal system origin and colonial links are stronger for equities than for bonds, although the differences are not statistically significant.

In relation to the degree of market openness and development, the results show that both international equity and bond holdings react positively and significantly to capital account liberalization (differences between assets are not statistically significant). International equity and bond holdings also react positively and significantly to financial sector and stock market development and the effect is significantly stronger for equities than for bonds.

Regarding the quality of institutions, the results show that international equity and bond holdings respond positively to transparency. This effect is more pronounced for equities than for bonds. International equity and bond holdings also respond positively and significantly to investors protection (differences between assets are not statistically significant). Corruption has a negative and significant effect on international equity and bond holdings (differences between assets are not statistically significant).

Aggarwal, Kearney and Lucey (2012) investigate the determinants of international equity and bond holdings of 174 origin countries into 50 countries from 2001 to 2007. The authors analyse the effect of three sets of variables: (1) gravitational variables, namely the GDP growth rate of both origin and destination countries and the geographical distance between them; (2) variables designed to capture the characteristics of institutions in origin and destination countries, namely the degree of equity and bond market development, the quality of accounting standards, investors protection and country risk; (3) cultural variables, including cultural distance and the degree of masculinity, individualism, uncertainty avoidance and power distance in both origin and destination countries, as well as three dummies for common language, common legal system origin and common religion.

The results indicate that international equity holdings are positively and significantly affected by the GDP growth rates of both origin and destination countries and negatively and significantly affected by the geographical distance between them. International equity holdings are also affected by the quality of institutions, namely the development of equity and bond markets, the degree of investor protection, the quality of accounting standards and country risk. International equity holdings are also affected by cultural variables, namely

common language, common religion, the degree of masculinity, individualism and power distance.

In turn, international bond holdings are negatively and significantly affected by geographical distance, while GDP growth rates of both origin and destination countries are not statistically significant. International bond holdings are also affected by the quality of institutions, namely the development of equity and bond markets, the degree of investor protection in destination country, the quality of accounting standards in destination country, and origin and destination country risk. Furthermore, international bond holdings are also affected by cultural variables, namely common language, common religion, the degree of masculinity, individualism and power distance.

In terms of the differences in the determinants of both types of assets, the results indicate that: the effect of geographical distance on international holdings is stronger for bonds than for equities, whereas the influence of origin and destination GDP growth rates are stronger for equities than for bonds; the effect of equity (bond) market development is higher for equities (bonds) than for bonds (equities) and the effect of investor protection in the destination country is stronger for equities than for bonds; the effect of common language and common religion, as well as individualism in origin country, appears to be stronger for equities than for bonds, whereas the effect of masculinity and power in origin country is higher for the latter than the former (the degree of masculinity, individualism and power in destination country tends to increase equity and bond holdings by similar amounts).

Overall, empirical studies on the determinants of both international equity and bond investment tend to support the important role of size, information costs and familiarity, as well as transparency and corporate governance, on the determination of both international equity and bond investment. However, the results are inconclusive and limited in comparing the relative importance of those determinants to both types of assets. For instance, regarding the relative importance of information costs on the determination of international equity and bond investment, the results are inconclusive: while the effects of bilateral trade and common language are usually found to be stronger for equities than for bonds, the effect of geographical distance is usually found to be stronger for bonds than for equities. The same applies to the relative importance of transparency on the determination of international equity and bond investment: while Daude and Fratzscher (2008) conclude for its effect to be stronger for equities than bonds, Coeurdacier and Martin (2007) and De Santis and Gérard (2006) find opposite results. Thus, evidence remains basically inconclusive. Furthermore, these studies are limited since they only compare the regression coefficients found for equity

investment with those found for bond investment, without assessing the statistical significance of the differences found. The only exception is Daude and Fratzscher (2008).

2.7 Conclusion

This chapter reviewed the theoretical and empirical literature on international portfolio investment.

The theoretical literature argues that international portfolio investment allow investors to simultaneously reduce the risk and increase expected returns of their portfolios, thereby increasing their utility. According to the international CAPM, investors will maximize their utility by combing the domestic risk-free asset with the world market portfolio, in proportions that depend on their degree of risk-aversion. The world market portfolio, theoretically comprising all assets traded in the world market in proportions equal to contribution of each asset to the world market capitalisation, is therefore the portfolio of risky assets that, in equilibrium, should be held by all investors, regardless of their level of risk aversion. The world market portfolio should the optimally hedged against exchange rate risk if the PPP does not hold.

However, there is clear evidence that the portfolios actually held by investors diverge from the world market portfolio. Particularly, in relation to the predictions of the international CAPM, investors tend to overweight domestic assets and underweight foreign assets in their portfolios. These phenomena, known as the home and foreign biases, are still severe nowadays, despite the trend towards increasing international diversification, especially in developed countries.

Numerous empirical studies have attempted to provide theoretical explanations for the home and foreign biases phenomena, among which are: the need to hedge domestic risks; direct and indirect barriers to international portfolio investment; information costs; the lack of transparency and corporate governance in investment destination countries; and behavioural explanations, based on familiarity, recognition, patriotism, among others. While the first two explanations seem to lack empirical support, the other explanations seem to gain strength in explaining the home and foreign biases. Yet, it is unlikely that there is a single explanation for these phenomena and thus all explanations discussed in the literature may be relevant.

There are several empirical studies on the determinants of international portfolio investment. These studies tend to differ on the basis of the sample considered, namely the investment origin and destination countries, the type of asset and investors considered, as well as the period of investment under analysis. Moreover, these studies also differ in terms of the

variables and measures used to assess international portfolio investment and its determinants. Altogether, these facts complicate the comparability and the generalisation of empirical results.

Nevertheless, from the review of the main empirical studies on the determinants of international equity investment, it is possible to conclude that, overall, empirical evidence tends to support the important role of destination country market size and development, as well as information costs and familiarity, especially geographical distance, bilateral trade and common language, in the determination of international equity investment. The importance of transparency and corporate governance, namely the quality of the legal system and investor protection, is also supported. Empirical evidence on the determinants of international equity investment also tend to support the return-chasing behaviour of investors, while tend to contradict the motivation for portfolio risk diversification. Although less explored, evidence on the determinants of international bond investment tends to corroborate the findings relative to equity investment.

From the review of empirical studies that analyse the determinants of both equity and bond investment, it is possible to conclude that they support the general conclusions on the importance of size, information costs and familiarity, as well as transparency and corporate governance, on the determination of both international equity and bond investment. However, they are inconclusive and limited in comparing the importance of those determinants between both assets. For instance, regarding the relative importance of information costs on the determination of international equity and bond investment, the results are inconclusive: while the effects of bilateral trade and common language are usually found to be stronger for equities than for bonds, the effect of geographical distance is usually found to be stronger for bonds than for equities. The same applies to the relative importance of transparency on the determination of international equity and bonds investment: while some authors conclude for its effect to be stronger for equities than for bonds, others find opposite results. Thus, evidence remains basically inconclusive. Furthermore, these studies are limited since they only compare the regression coefficients found for equities with those found for bonds, without assessing the statistical significance of the differences found. The only exception is Daude and Fratzscher (2008).

Chapter 3: The determinants of international equity investment: Do they differ between institutional and noninstitutional investors?

3.1 Introduction

This chapter analyses and compares the determinants of international equity investment of institutional and noninstitutional investors.

Although there are several empirical studies that focus on the determinants of international equity investment, such studies do not compare those determinants between different types of investors, since they make use of aggregated data for all investors within each origin country (e.g. Ferreira and Miguel 2007, Lane and Milesi-Ferretti 2008) or they consider disaggregated data for only one type of investor, such as mutual funds (e.g. Aggarwal, Klapper and Wysocki 2005, Chan, Covrig and Ng 2005) or households (e.g. Kyrychenko and Shum 2006, Bailey, Kumar and Ng 2008).

In this context, it is reasonable to question whether international equity investment of different types of investors is driven by the same factors and whether the importance attributed to each factor is similar. Based on the information costs theory, it is expected that international equity investment of more informed, experienced and sophisticated investors, such as institutional investors, should be less influenced by information costs and familiarity than international equity investment of less informed, experienced and sophisticated investors, such as noninstitutional investors. In fact, De Marzo, Kaniel and Kremer (2004) find that the impact of familiarity depends on the degree to which the investor is informed: more informed investors are less affected by familiarity. In the same line, Massa and Simonov (2006) find that familiarity mostly affects less informed investors, thereby concluding that the more sophisticated the investor is, the weaker is the effect of familiarity on decision-making. A similar result has also been provided by Grinblatt and Keloharju (2001), who find that the influence of distance and culture on equity investment is smaller for more sophisticated investors. On the contrary, it is expected that financial variables, such as return and risk diversification potential, should have a stronger effect on the international equity investment of more informed, experienced and sophisticated investors, such as institutional investors, relative to less informed, experienced and sophisticated investors, such as noninstitutional investors.

The objectives of this chapter are threefold. First, to investigate the determinants of international equity investment of institutional investors. Second, to investigate the determinants of international equity investment of noninstitutional investors. Third, to

investigate the differences in the determinants of international equity investment between institutional and noninstitutional investors. For this purpose, a gravity-model is applied to the international equity investment of institutional and noninstitutional investors from 20 OECD countries, at the end of years 2001 to 2009. Additionally, the robustness of results to the consideration of different business cycles is tested.

This chapter offers important contributions to the literature. First, by considering simultaneously institutional and noninstitutional investors, it is possible to purge the analysis of the determinants of international equity investment from the hypothesis of homogeneity of preferences between institutional and noninstitutional investors, which underlies studies that use aggregated data for all investors within each investment origin country. Moreover, and more importantly, it is possible to compare the determinants of international equity investment between institutional and noninstitutional investors. This issue has not been addressed by previous studies, as they either consider all investors aggregately (e.g. Ferreira and Miguel 2007, Lane and Milesi-Ferretti 2008), or considered just one type of investor, such as mutual funds (e.g. Aggarwal, Klapper and Wysocki 2005, Chan, Covrig and Ng 2005) or households (e.g. Kyrychenko and Shum 2006, Bailey, Kumar and Ng 2008). Second, by using a continuous 9 year period of data, the influence of business cycles in the determinants of international equity investment is also taken into account. This issue has not been explored in the literature, as previous studies only consider one year (e.g. Faruqee, Li and Yan 2004, Lane and Milesi-Ferretti 2008), two years (e.g. Chan, Covrig and Ng 2005, Berkel 2007), or three or more discontinuous years of investment analysis (e.g. Ferreira and Miguel 2007, Mishra 2007).

This chapter is organised as follows. Section 2 presents the research design, namely the sample, variables and estimation procedures. Section 3 presents and discusses the empirical results. Section 4 analyses the robustness of empirical findings to the consideration on different business cycles. Finally, section 5 concludes.

3.2 Research design

3.2.1 Sample

The empirical analysis is based on international portfolio investment holdings data collected by the Coordinated Portfolio Investment Survey (CPIS), under the auspices of the International Monetary Fund (IMF). The CPIS data can be disaggregated by: type of asset;

sector of the asset holder; country of residence of the asset holder; country of residence of the asset issuer; and year of investment.

According to the type of asset, the CPIS breaks down international portfolio investment holdings by equity securities, long-term debt securities and short-term debt securities. Given the objective of this study, only holdings on equity securities are considered.

According to the sector of the asset holder (hereafter, type of investor), the CPIS breaks down international portfolio investment holdings by monetary authorities, banks, other financial institutions (including insurance companies, mutual funds and others), government, and nonfinancial sector (including nonfinancial companies, households and others). Considering the purpose of this study, only the holdings of banks and other financial institutions (institutional investors) and the holdings of nonfinancial sector (noninstitutional investors) are considered. Monetary authorities and government are thus excluded from the sample.

As for the country of residence of the asset holder (hereafter, investment origin country) and country of residence of the asset issuer (hereafter, investment destination country), the CPIS considers several countries. However, after taking into account the availability of data on other variables, only OECD countries are considered. Among these, Luxembourg[24], as well as countries that become members of OECD in 2010 (Chile, Estonia, Israel and Slovenia)[25] are excluded. International equity investment holdings by sector of the holder are not available for Belgium, Canada, Iceland, Ireland, Korea, Poland, Slovak Republic, Switzerland and United States and, as such, these countries are also excluded from the sample of investment origin countries.

Therefore, the sample of investment origin countries comprises 20 OECD countries: Australia, Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey and United Kingdom. In turn, the sample of investment destination countries comprises 29 OECD countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

[24] Lane and Milesi-Ferretti (2008) also excluded off-shore financial centres, such as Luxembourg. They argue that off-shore financial centres "act as pure intermediaries and are neither true sources nor final destinations of investment" Milesi-Ferretti (2008, pp. 543).

[25] These countries were excluded since they were not members of OECD in the time period under analysis (2001-2009).

Concerning the years of investment, data on international equity investment holdings is available, on a yearly basis, for 1997 and from 2001 onwards. In this study, a continuous 9 year period is considered, namely from 2001 to 2009[26].

3.2.2 Variables

The dependent and independent variables are defined on the basis of the existing theoretical and empirical literature on international portfolio investment, reviewed in the previous chapter.

Regarding the dependent variable, international equity investment is measured by the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* at the end of year *t*, calculated as in equation 3.1:

$$w_{kijt} = \frac{H_{kijt}}{\sum_{j=1}^{29} H_{kijt}} . 100 \qquad \textbf{(3.1)}$$

Where w_{kijt} is the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* at the end of year *t*; H_{kijt} is the value of destination country *j* equities held by investor *k* of origin country *i* at the end of year *t*. Data is extracted from CPIS IMF. It should be noted that, in the computation of the dependent variables, international equity holdings reported as unavailable, confidential, zero value[27] or negative values (short-selling) were excluded.

Following the theoretical framework developed by Martin and Rey (2004) for the application of gravity-models in the analysis of international portfolio investment, three groups of independent variables are considered: (1) size variables; (2) information costs variables; (3) financial variables.

The first group of variables includes origin and destination country size, both measured by GDP[28]. More precisely, it considers the GDP of origin country *i* in year *t* and the GDP of destination country *j* in year *t*. Data is obtained from the World Bank. It is expected that international equity investment is positively affected by the size of both origin and destination countries, a result that has been supported in several empirical studies (e.g. Faruquee, Li and Yan 2004, Coeurdacier and Martin 2007, Diyarbakirlioglu 2011).

[26] At the time of the last data collection, 2009 was the last year of available CPIS data.

[27] Values of international equity holdings less than 500.000 US dollars are also reported as zero values.

[28] Faruquee, Li and Yan (2004), Coeurdacier and Martin (2006), Mishra (2007) and Diyarbakirlioglu (2011), among others, also use GDP to proxy for the size of origin and/or destination countries.

The second group of variables includes the distance between origin and destination countries, as well as additional information costs variables, such as bilateral trade, transparency, contiguity, common language and common currency.

Distance between origin and destination countries has been traditionally used as a proxy for transaction and information costs. In fact, several empirical studies have shown that international equity investment is negative and significantly affected by distance[29]. Portes, Rey and Oh (2001) argue that the observed negative relationship between distance and international equity investment can be explained by information costs: "countries which are near each other tend to know much more about each other, either because of direct interaction between their citizens for tourism or business, or because of better media coverage, or because they tend to learn each other's languages" (Portes, Rey and Oh, 2001, pp. 784). In fact, Diyarbakirlioglu (2011) shows that the negative influence of geographical distance on international equity investment is due to information costs, rather than cultural differences between countries.

In this study, distance between origin and destination countries is measured by the geographical distance between the capital city of origin country *i* and the capital city of destination country *j*. Data is collected from the Geodesic Distance Database of the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). It is expected that geographical distance negatively affects international equity investment. As a measure of information costs, and to some extent, of the degree of familiarity between origin and destination countries, it is also expected that the negative effect of geographical distance on international equity investment is stronger for noninstitutional than for institutional investors.

Additional information costs variables include bilateral trade, transparency, contiguity, common language and common currency.

Portes and Rey (2005) suggest that bilateral trade contributes to increase the flow of information between trade partners, thereby reducing information costs associated with international equity investment. Lane and Milessi-Ferretti (2008) show that there is a strong link between bilateral trade and international equity investment and they suggest that this relationship is particularly consistent with the informational potential of bilateral trade. Aviat and Coeurdacier (2007) find that trading in the goods market reduces informational asymmetries in the financial markets (and vice versa) and, hence, international asset holdings are strongly affected by trade patterns. Diyarbakirlioglu (2011) underlines the importance of

[29] e.g. Portes, Rey and Oh (2001), Al-Khail (2003), Bertaut and Kole (2004), Faruquee, Li and Yan (2004), Berkel (2007), Coeurdacier and Martin (2007), Ferreira and Miguel (2007), Daude and Fratzner (2008), Diyarbakirlioglu (2011) and Aggarwal, Kearney and Lucey (2012).

bilateral trade in the explanation of international equity investment through its potential as an information variable. Al-Khail (2003), Bertaut and Kole (2004), Faruquee, Li and Yan (2004), De Santis and Gérard (2006), Coeurdacier and Martin (2007), Ferreira and Miguel (2007) and Mishra (2007), among others, also support the importance of bilateral trade in determining international equity investment. In this study, bilateral trade is measured by the weight of destination country *j* on total trade (imports plus exports) of origin country *i* in year *t*. Data is obtained from United Nation's Commodity Trade Statistics (COMTRADE).

The transparency of the investment destination country is also considered. Diyarbakirlioglu (2011) argues that more transparency implies less (perceived) risk and/or low information costs, thereby encouraging investors to invest more in more transparent countries. Indeed, Diyarbakirlioglu (2011) finds that international equity investment is positively and significantly affected by country transparency. Gelos and Wei (2005) also show that transparency has a positive influence on international equity investment as investors prefer to hold more assets from more transparent countries. The positive effect of transparency on international equity investment has also been supported by other empirical studies (e.g. De Santis and Gérard 2006, Coeurdacier and Martin 2007, Daude and Fratzner 2008). In this study, the transparency of destination country *j* in year *t* is assessed by the Corruption Perception Index (CPI), from Transparency International. The CPI evaluates the perception of corrupt practices in both public and private sectors, scoring countries on a scale from 0 (highly corrupt) to 10 (very clean).

A set of dummies for contiguity, common language and common currency is also included as these variables are commonly used to capture information costs. Contiguity, a dummy that takes a value of one if origin country *i* and destination country *j* are geographically contiguous, is included since it is expected that information flows, and hence, international equity investment is more intense between neighbour countries, as documented by Foad (2008). Similarly, common language, a dummy that takes a value of one if origin country *i* and destination country *j* share the same official language, is included since it is expected that common language significantly reduces the cost of gathering, interpreting and comparing information, as suggested by Faruquee, Li and Yan (2004). In fact, several empirical studies present evidence of a positive and significant relationship between common language and international equity investment (e.g. Al-Khail 2003, Amadi 2004b, Faruquee, Li and Yan 2004, Ferreira and Miguel 2007, Mishra 2007, Lane and Milesi-Ferretti 2008). Common currency, a dummy that takes a value of one if origin country *i* and destination country *j* share the same currency, is included since it is expected that a common currency will reduce the information

costs, as well as transaction costs, thereby increasing international equity investment. From the origin and destination countries included in the sample only members of European Monetary Union (EMU) share the same currency – the euro. Coeurdacier and Martin (2007) find that the euro has contributed to decrease transaction costs and, hence, increase international equity investment within the euro zone. De Santis and Gérard (2006) also present evidence that euro area investors assign higher portfolio weights to assets from euro area countries. Data on contiguity and common language is obtained from the Geodesic Distance database from CEPII. Common currency is constructed on the basis of the information provided by The World Factbook of Central Intelligence Agency (CIA).

The additional information costs variables (bilateral trade, transparency, contiguity, common language and common currency) should positively affect international equity investment in so far as they proxy for lower information costs and greater familiarity between investment origin and destination countries. For the same reason, this positive effect should be stronger for noninstitutional than for institutional investors.

The third group of variables includes financial variables that capture the development, return and risk diversification potential of destination country equity market.

The development of destination country equity market is included since more developed markets tend to be more structured, more liquid, and with lower transaction costs (Ferreira and Miguel 2007). In fact, several empirical studies show that destination country equity market development has a positive and significant impact on international equity investment[30]. In this study, the development of destination country equity market is proxied by the ratio between the equity market capitalisation and the GDP of destination country *j* in year *t*. Data on equity market capitalisation and GDP are obtained from the World Bank.

The return of destination country equity market index is included to evaluate the return chasing behaviour of investors and is proxied by the annualised mean of monthly returns on destination country *j* equity market index over a five years period (including year *t*). Monthly returns are calculated on the basis of monthly prices obtained from Morgan Stanley Capital International (MSCI). According to the return chasing behaviour hypothesis (e.g. Bohn and Tesar 1996, Froot, O'Connell and Seasholes 2001, Brennan, Cao, Strong and Xu 2005), it is expected that international equity investment is positively affected by destination country equity market return. Several empirical studies have supported this hypothesis (e.g. Faruquee, Li and Yan 2004, De Santis and Gérard 2006, Coeurdacier and Martin 2007, Ferreira and Miguel

[30] e.g. Amadi 2004b, Chan, Covrig and Ng 2005, Berkel 2007, Coeurdacier and Martin 2007, Ferreira and Miguel 2007, Daude and Fratzner 2008, Lane and Milesi-Ferretti 2008.

2007). Nevertheless, other studies document the opposite, i.e., a superior investment in equity markets with lower past returns. For instance, Hamao and Mei (2001) find that, unlike domestic investment, foreign investment is negatively related to past excess returns. Diyarbakirlioglu (2011) finds that investors hold fewer equity assets from destinations with higher risk-adjusted returns. Grinblatt and Keloharju (2000) suggest that contrarian behaviour is inversely related to the degree of investors' sophistication: "the more sophisticated the investor and the greater the wealth invested in stocks, the less contrarian is the investment strategy" (Grinblatt and Keloharju, 2000, pp. 45-46).

The risk diversification potential of destination country equity market is proxied by the correlation coefficient between the monthly returns of the equity market index of origin country *i* and the equity market index of destination country *j* over a five year period (including year *t*). Return correlation is expected to be negatively related to international equity investment, since the higher the return correlation, the lower the risk diversification potential (Solnik 1974a). Although some empirical studies support this negative relationship between return correlation and international equity investment (e.g. Faruquee, Li and Yan 2004), others present evidence of an opposite relationship (e.g. Amadi 2004b, Mishra 2007, Ferreira and Miguel 2007, Lane and Milesi-Ferretti 2008).

Table 3.1 summarises the dependent and independent variables used in this study, while tables 3.2 and 3.3 present the descriptive statistics and the correlation matrix, respectively.

Table 3.1: Determinants of international equity investment: dependent and independent variables

This table presents the dependent and independent variables used to investigate the determinants of international equity investment. The first column presents the category of the dependent or independent variable. The second column presents the variable(s) used within each category. The third column presents the dimension of each variable (i.e., if it varies at the level of each investor *k*, origin country *i*, destination country *j* and/or year of investment *t*). The fourth column presents a description of the variable, particularly the way it is measured. Finally, the fifth column presents the data source.

Category	Variable	Dim.	Description	Data Source
International Equity Investment	Investment	*kijt*	Weight of destination country *j* in international equity portfolio of investor *k* of origin country *i* in year *t* (natural logarithm)	CPIS IMF
Size	GDP	*it*	Origin country *i* GDP in year *t* (natural logarithm)	World Bank
	GDP	*jt*	Destination country *j* GDP in year *t* (natural logarithm)	World Bank
Information Costs	Distance	*ij*	Geographical distance between the capital city of origin country *i* and destination country *j* (natural logarithm)	CEPII
	Trade	*ijt*	Weight of destination country *j* in total trade (imports plus exports) of origin country *i* in year *t* (natural logarithm)	COMTRADE
	Transparency	*jt*	Corruption Perceptions Index that scores, in year t, destination country *j* on a scale from 0 (highly corrupt) to 10 (very clean), on the basis of perception of corrupt practices in both public and private sectors	Transparency International
	Contiguity	*ij*	Dummy variable that equals one if origin country *i* and destination country *j* are geographically contiguous	CEPII
	Language	*ij*	Dummy variable that equals one if origin country *i* and destination country *j* share the same official language	CEPII
	Currency	*ijt*	Dummy variable that equals one if origin country *i* and destination country *j* share the same currency	CIA World Factbook
Equity Market Development	Capitalisation	*jt*	The ratio between equity market capitalisation of destination country *j* in year *t* and destination country *j* GDP in year *t* (natural logarithm)	World Bank
Return	Return	*jt*	Annualised mean of monthly return of destination country *j* equity market index over a 5 years period (including year *t*)	MSCI
Diversification	Correlation	*ijt*	Correlation coefficient between the monthly returns on the equity market index of origin country *i* and destination country *j* over a 5 years period (including year *t*)	MSCI

Table 3.2: Determinants of international equity investment: descriptive statistics

This table presents the descriptive statistics relative to the dependent and independent variables used to investigate the determinants of international equity investment. The first column presents the variables. The second column presents the dimension of each variable (i.e., if it varies at the level of each investor *k*, origin country *i*, destination country *j* and/or year of investment *t*). The third to seventh columns present the number of observations, the mean, the standard deviation, the minimum and the maximum value of each variable, respectively. For a detailed description of the dependent and independent variables please see table 3.1.

Variable	Dim.	Obs.	Mean	Std.Dev.	Min.	Max.
Investment	*kijt*	7936	-0,321	2,500	-13,323	4,605
GDP	*it*	7936	27,057	1,120	24,697	29,247
GDP	*jt*	7936	27,123	1,311	22,793	30,291
Distance	*ij*	7936	7,698	1,113	4,088	9,883
Trade	*ijt*	7933	0,416	1,322	-5,452	4,313
Transparency	*jt*	7936	7,218	1,850	3,100	9,900
Capitalisation	*jt*	7936	4,129	0,723	1,637	5,736
Return	*jt*	7763	6,243	11,271	-22,737	40,775
Correlation	*ijt*	7763	0,631	0,177	-0,032	0,974

Table 3.3: Determinants of international equity investment: correlation matrix

This table presents the correlation matrix relative to the independent variables used to investigate the determinants of international equity investment. The first column presents the variables. The second column presents the dimension of each variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). The remaining columns present the correlation coefficient between each pair of variables. For a detailed description of independent variables please see table 3.1.

Variable	Dim.	GDP	GDP	Distance	Trade	Transp.	Cap.	Return	Corr.
GDP	*it*	1							
GDP	*jt*	-0,055	1						
Distance	*ij*	0,151	0,248	1					
Trade	*ijt*	-0,093	0,529	-0,525	1				
Transparency	*jt*	-0,032	0,031	-0,016	0,112	1			
Capitalisation	*jt*	-0,061	0,341	0,126	0,195	0,566	1		
Return	*jt*	0,036	-0,099	0,001	-0,162	-0,157	0,154	1	
Correlation	*ijt*	0,149	0,209	-0,301	0,329	0,139	0,024	-0,163	1

From the descriptive statistics table, it is possible to see that the mean weight of each destination country in investors' international equity portfolio is -0,321 (corresponding to 5,23% in the variable original values). The average GDP of origin countries included in the sample is 27,057 (corresponding to $1{,}04 \times 10^{12}$ US dollars), with Japan (New Zealand) presenting the highest (lowest) GDP in the sample period. The average GDP of destination countries included in the sample is 27,123 (corresponding to $1{,}52 \times 10^{12}$ US dollars), with USA (Iceland) presenting the highest (lowest) GDP in the sample period.

The geographical distance between the capital cities of origin and destination countries in the sample is, on average, 7,698 (4042 km), with a minimum of 4,088 (60 km) between Vienna and Bratislava and a maximum of 9,883 (19586 km) between Madrid and Wellington. On average, the weight of destination country in total trade of origin country is 0,416 (3,34%), with a minimum of -5,452 (0,004%), between Hungary and Iceland, and a maximum of 4,313 (74,65%), between México and USA. The CPI score of destination countries in the sample is, on average, 7, with Finland (Mexico) showing the highest (lowest) transparency score.

In relation to the development, return and risk diversification potential of the destination country equity market, it is possible to observe that: on average, the equity market capitalisation scaled by GDP of the destination countries included in the sample is 4,129 (about 78%), with Switzerland (Slovakia) being the destination country with the most (less) developed equity market; the return on the equity market index of the destination countries included in the sample is, on average, 6%, with the equity market index of Czech Republic (Ireland) exhibiting the highest (lowest) returns; the average correlation coefficient between the return on the equity market index of origin and destination countries in the sample is 0,63, with

Germany and France having the highest correlation and New Zealand and Finland the lowest correlation.

From the correlation matrix, it is possible to see that there is a moderate correlation between bilateral trade and destination country GDP (0,529), as well as between bilateral trade and geographical distance (-0,525). In fact, this was expected since the gravitational model is also used to explain bilateral trade patterns and therefore destination country GDP and geographical distance also emerge as important determinants. It should also be noted that the development of destination country equity market is correlated with destination country transparency (0,566). Thus, including these variables simultaneously can create problems of multicolinearity. This potential problem will be considered by reporting the mean variance inflation factor (VIF) in individual regressions.

3.2.3 Estimation

To estimate the determinants of international equity investment of both institutional and noninstitutional investors, separate OLS regressions are run for each type of investor. By running separate regressions for each type of investor, it is possible to identify the importance and significance of each independent variable in the determination of international equity investment of institutional and noninstitutional investors.

The estimation procedure can be represented by equation 3.2:

$$ln(w_{kijt}) = \alpha + \beta . X_{ijt} + v_{kijt} \quad \textbf{(3.2)}$$

Where w_{kijt} is the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* at the end of year *t* (calculated as in equation 3.1); α is a constant; X_{ijt} is a vector of independent variables (fully described in the previous subsection); and v_{kijt} are cluster-robust standard errors[31], with $v_{kijt} = \mu_i + \varepsilon_{kijt}$.

Within this estimation procedure, four empirical specifications are proposed[32]. The first empirical specification considers the traditional gravitational variables, i.e., the size of both origin and destination countries and the distance between them. The second empirical specification considers, besides the traditional gravitational variables, the additional

[31] Since investors are clustered within each origin country *i*, the cluster is defined at the level of each origin country *i*.

[32] The four empirical specifications only differ with respect to the independent variables included in the vector X_{ijt} of equation 3.2.

information costs variables, namely bilateral trade, transparency, contiguity, common language and common currency. The third empirical specification considers, besides the traditional gravitational variables, the financial variables, namely the development, return and risk diversification potential of destination country equity market. Finally, the fourth empirical specification considers all variables simultaneously.

To compare the determinants of international equity investment between institutional and noninstitutional investors, a single pooled OLS regression for both types of investors is run. This regression includes: a set of independent variables; a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors; differential independent variables, that equal the product of each independent variable by the dummy variable d.

The estimation procedure can be represented by equation 3.3:

$$ln(w_{kijt}) = \alpha + d + \beta.X_{ijt} + \beta'.X_{ijt}.d + v_{kijt} \quad \textbf{(3.3)}$$

Where w_{kijt} is the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* at the end of year *t* (calculated as in equation 3.1); α is a constant; d is a dummy variable, that equals one for institutional investors and zero for noninstitutional investors; X_{ijt} is a vector of independent variables (fully described in the previous subsection); and v_{kijt} are cluster-robust standard errors, with $v_{kijt} = \mu_i + \varepsilon_{kijt}$.

This estimation procedure will allow to compare the coefficient of each independent variable between institutional and noninstitutional investors, as well as to present the statistical significance of the difference[33], as follows: α and β represent the intercept (constant) and the coefficient of each independent variable for the omitted group, i.e., noninstitutional investors, while d and β' represent the difference in the intercept and in the coefficient of each independent variable between institutional and noninstitutional inventors.

3.3 Empirical results

3.3.1 The determinants of international equity investment: institutional investors

Table 3.4 presents the determinants of international equity investment of institutional investors.

[33] This procedure is similar to the statistical test proposed by Cohen (1983) for comparing regression coefficients across subsamples.

Table 3.4: Determinants of international equity investment of institutional investors

This table presents the determinants of international equity investment of institutional investors in the period 2001-2009. International equity investment is measured by the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). Independent variables are shown in the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). For each independent variable, the regression coefficient, t-statistics and the respective statistical significance are displayed. The estimation is based on a OLS regression with cluster-robust standard errors, at the level of each origin country *i*. The last six lines present: the number of observations (N); F-statistics and the statistical significance for the model; the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); the Root Mean Squared Error (RMSE); and the Variance Inflation Factor (VIF). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)		(4)	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-24,928	-10,41***	-15,872	-6,43***	-23,882	-11,25***	-15,417	-6,10***
GDP	*it*	0,004	0,05	-0,051	-0,76	0,065	0,92	-0,010	-0,14
GDP	*jt*	1,112	18,60***	0,582	6,32***	0,912	20,49***	0,504	5,84***
Distance	*ij*	-0,707	-6,96***	-0,066	-0,61	-0,742	-7,13***	-0,160	-1,33
Trade	*ijt*			0,684	6,62***			0,595	5,63***
Transparency	*jt*			0,202	6,86***			0,067	2,72**
Contiguity	*ij*			0,325	1,75*			0,342	1,94*
Language	*ij*			0,343	1,76*			0,226	1,01
Currency	*ij*			0,380	1,64			0,398	1,78*
Capitalisation	*jt*					0,838	7,02***	0,621	6,32***
Return	*jt*					-0,031	-6,58***	-0,019	-4,31***
Correlation	*ijt*					-0,382	-1,21	-0,294	-0,98
N		5230		5228		5121		5119	
F		136,45***		121,36***		90,70***		186,07***	
R^2		0,398		0,489		0,444		0,490	
R_a^2		0,398		0,488		0,443		0,489	
RMSE		1,826		1,683		1,688		1,616	
Mean VIF		1,07		2,09		1,23		2,14	

The first empirical specification considers the size of origin and destination countries and the distance between them as sole determinants of international equity investment of institutional investors. The traditional gravitational variables perform relatively well as this specification explains approximately 40% of the variability of international equity investment. As expected, the size of destination country positively and significantly affects international equity investment, supporting the results of previous empirical studies (e.g. Faruquee, Li and Yan 2004). Origin country size is not statistically significant. The distance between origin and destination countries, proxing for information costs, affects, as expected, negatively and significantly international equity investment, which is consistent with the results of previous empirical studies (e.g. Al-Khail 2003, Bertaut and Kole 2004, Faruquee, Li and Yan 2004, Berkel 2007, Ferreira and Miguel 2007, Diyarbakirlioglu 2011). Hence, institutional investors exhibit a significant preference towards equities from more developed and nearby countries.

In the second empirical specification, additional information costs variables are introduced, namely bilateral trade, transparency, contiguity, common language and common currency. These variables have high explanatory power as they contribute to increase the percentage of international equity investment variability explained by the model from 40% to 49%.

As expected, bilateral trade between origin and destination countries contributes significantly to increase international equity investment of institutional investors. This result demonstrates the power of bilateral trade as a vehicle for information transmission between countries and is consistent with the results of previous studies (e.g. Al-Khail 2003, Bertaut and Kole 2004, Faruquee, Li and Yan 2004, Mishra 2007, Ferreira and Miguel 2007, Diyarbakirlioglu 2011). It should be noted that the introduction of bilateral trade reduces the size of the coefficients of destination country size and of geographical distance, probably due to the correlation between these variables[34], but only the latter loses its statistical significance. This suggests that the statistical significance of geographical distance in the previous empirical specification may be simply reflecting the intensity of trade that naturally occurs between nearby countries. In fact, this result goes in line with Aviat and Coeurdacier (2007) that conclude that "distance affects asset holdings mainly through its impact on trade in goods" (Aviat and Coeurdacier, 2007, pp. 48).

International equity investment of institutional investors is also positively and significantly determined by destination country transparency. Thus, institutional investors prefer to hold more equities from more transparent countries probably due to the fact that information costs tend to be lower in these countries. This evidence is consistent with the results of Gelos and Wei (2005) and Gande and Parsley (2010), for mutual funds, and of De Santis and Gérard (2006), Coeurdacier and Martin (2007), Daude and Fratzner (2008) and Diyarbakirlioglu (2011), for investors in general.

Contiguity, common language and common currency also tend to have a positive influence on international equity investment of institutional investors, yet with residual statistical significance. In fact, only contiguity and common language are statistically significant at 10% level. Thus, although institutional investors exhibit a preference towards equities of contiguous countries, that share the same language and currency, the significance of these factors in the composition of their portfolio is quite limited.

[34] Despite the correlation between these variables, the mean VIF is within acceptable values, not reflecting multicolinearity problems in the regression.

The third empirical specification considers, besides the traditional gravitational variables, the financial variables, namely the development, return and risk diversification potential of the destination country equity market. The consideration of the financial variables contributes to increase the percentage of international equity investment variability explained by the model from 40% to 44%. Thus, financial variables have explanatory power although lower than that shown by the additional information costs variables considered in the previous empirical specification.

As expected, the development of destination country equity market has a positive and significant influence on international equity investment, indicating that institutional investors prefer to hold equities from countries with more developed equity markets in their portfolios. This evidence is consistent with the results of Amadi (2004b), Chan, Covrig and Ng (2005), Berkel (2007), Ferreira and Miguel (2007) and Lane and Milesi-Ferretti (2008), among others. Contrary to expectations, the return of destination country equity market index negatively affects international equity investment of institutional investors and this negative effect is statistically significant. This result runs against the return chasing behaviour hypothesis, thereby supporting the results of Hamao and Mei (2001) and Diyarbakirlioglu (2011). International equity investment of institutional investors also tends to be negatively, yet not significantly, determined by the correlation between the returns of origin and destination countries equity market indices. This suggests that institutional investors are somewhat concerned with risk diversification when investing abroad.

Finally, in the fourth empirical specification all variables are included. Together, these variables are only able to explain approximately half of institutional investors' international equity investment variability, which is a bit short of expectations. In relation to the previous specifications, all independent variables maintain their sign and only geographical distance and common language lose statistical significance. In contrast, common currency gains statistical significance when all variables are considered. Thus, the results suggest the importance of destination country size, information costs (namely bilateral trade, destination country transparency, contiguity and common currency), as well as the development and return of destination country equity market, in the explanation of international equity investment of institutional investors.

3.3.2 The determinants of international equity investment: noninstitutional investors

Table 3.5 presents the determinants of international equity investment of noninstitutional investors.

Table 3.5: Determinants of international equity investment of noninstitutional investors

This table presents the determinants of international equity investment of noninstitutional investors in the period 2001-2009. International equity investment is measured by the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). Independent variables are shown in the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). For each independent variable, the regression coefficient, t-statistics and the respective statistical significance are displayed. The estimation is based on a OLS regression with cluster-robust standard errors, at the level of each origin country *i*. The last six lines present: the number of observations (N); F-statistics and the statistical significance for the model; the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); the Root Mean Squared Error (RMSE); and the Variance Inflation Factor (VIF). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)		(4)	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-30,501	-6,06***	-23,061	-5,68***	-31,261	-6,76***	-24,162	-5,65***
GDP	*it*	0,145	0,84	0,044	0,3	0,254	1,58	0,120	0,83
GDP	*jt*	1,231	14,43***	0,690	7,05***	0,967	14,77***	0,635	6,23***
Distance	*ij*	-0,977	-7,77***	-0,221	-1,62	-1,098	-12,04***	-0,395	-3,44***
Trade	*ijt*			0,710	6,45***			0,571	5,64***
Transparency	*jt*			0,498	9,56***			0,273	8,07***
Contiguity	*ij*			0,592	2,19**			0,891	3,79***
Language	*ij*			0,811	3,47***			0,334	1,65
Currency	*ij*			0,643	2,18**			0,642	2,27**
Capitalisation	*jt*					1,531	10,57***	0,954	8,88***
Return	*jt*					-0,059	-11,26***	-0,037	-8,04***
Correlation	*ijt*					-0,109	-0,2	-0,246	-0,43
N		2706		2705		2642		2641	
F		78,75***		86,32***		63,06***		59,23***	
R^2		0,365		0,553		0,518		0,585	
R_a^2		0,365		0,552		0,516		0,583	
RMSE		2,170		1,822		1,850		1,717	
Mean VIF		1,08		2,13		1,23		2,16	

The first empirical specification considers the traditional gravitational variables, i.e., the size of origin and destination countries and the distance between them. These variables explain approximately 37% of the variability of international equity investment of noninstitutional investors. The results suggest that noninstitutional investors exhibit a preference towards equities from more developed and nearby countries. In fact, international equity investment of noninstitutional investors is positively and significantly affected by the size of destination country, as well as negatively and significantly affected by the distance between origin and destination countries. This evidence is consistent with the results of

previous empirical studies (e.g. Faruquee, Li and Yan 2004). Origin country size is not significantly significant.

The second empirical specification includes the additional information costs variables, namely bilateral trade, transparency, contiguity, common language and common currency. These variables improve considerably the fit of the regression, from 37% to 55%, suggesting that they have an important role in explaining noninstitutional investors' international equity investment. Moreover, all the additional information costs variables are statistically significant and, as expected, positively drive international equity investment of noninstitutional investors.

In particular, the results suggest that bilateral trade significantly contributes to reduce information costs and to enhance international equity investment, which supports the results of previous empirical studies (e.g. Al-Khail 2003, Bertaut and Kole 2004, Faruquee, Li and Yan 2004, Mishra 2007, Ferreira and Miguel 2007, Diyarbakirlioglu 2011). As before, the introduction of bilateral trade in the regression reduces the magnitude of the coefficients of destination country size and of geographical distance[35], but only the latter loses its statistical significance. This goes in line with the conclusion of Aviat and Coeurdacier (2007, pp. 36) that "a large part of the impact of physical distance on bilateral asset holdings goes through its impact on trade".

The results also indicate the preference of noninstitutional investors for equities from more transparent countries. This evidence supports the argument that information costs are lower in more transparent countries and is consistent with the results found by De Santis and Gérard (2006), Coeurdacier and Martin (2007), Daude and Fratzner (2008) and Diyarbakirlioglu (2011). Noninstitutional investors also exhibit a preference towards equities of contiguous countries, that share the same language and the same currency, thereby corroborating the results of Foad (2008), of Al-Khail (2003), Amadi (2004b), Faruquee, Li and Yan (2004), Ferreira and Miguel (2007), Mishra (2007) and Lane and Milesi-Ferretti (2008) and of De Santis and Gérard (2006) and Coeurdacier and Martin (2007), respectively.

The third empirical specification considers the financial variables, namely the development, return and risk diversification potential of destination country equity market. These variables also have explanatory power, albeit lower than that of the additional information costs variables, as they contribute to increase the percentage of international equity investment variability explained by the model from 37% to 52%.

[35] As previously noticed, this is probably due to the correlation between these variables. Nevertheless, the mean VIF is within acceptable values.

The results indicate that noninstitutional investors prefer to hold equities from countries with more developed equity markets in their portfolios. In fact, the development of destination country equity market positively and significantly affects international equity investment of noninstitutional investors. This result goes in line with those of Amadi (2004b), Chan, Covrig and Ng (2005), Berkel (2007), Ferreira and Miguel (2007) and Lane and Milesi-Ferretti (2008), among others. Noninstitutional investors also exhibit the contrarian behaviour as their international equity investment is negatively and significantly determined by the return of destination country equity market index, which is consistent with the results of Hamao and Mei (2001) and Diyarbakirlioglu (2011). International equity investment of noninstitutional investors also tends to be negatively influenced by the correlation between the returns of origin and destination countries equity market indices. Yet, this effect is not statistically significant.

Finally, the fourth empirical specification includes all variables and is able to explain 59% of noninstitutional investors' international equity investment variability. In relation to the previous specifications, all independent variables maintain their sign and only common language loses statistical significance when all variables are considered. Thus, the results suggest the important role of destination country size, information costs (namely geographical distance, bilateral trade, destination country transparency, contiguity and common currency) as well as the development and return of destination country equity market in the explanation of international equity investment of noninstitutional investors.

3.3.3 The determinants of international equity investment: differences between institutional and noninstitutional investors

Table 3.6 presents the differences in the determinants of international equity investment between institutional and noninstitutional investors.

The results of the first empirical specification suggest that the positive influence of destination country size and the negative influence of geographical distance on international equity investment are significantly stronger for noninstitutional than for institutional investors. These results, in particular that concerning geographical distance, support the information costs theory, according to which international equity investment of less informed, experienced and sophisticated investors (i.e., noninstitutional) is more affected by information costs and familiarity than that of more informed, experienced and sophisticated investors (i.e., institutional).

Table 3.6: Determinants of international equity investment: differences between institutional and noninstitutional investors

This table presents the differences in the determinants of international equity investment between institutional and noninstitutional investors in the period 2001-2009. International equity investment is measured by the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*, that considers: the independent variables; a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors; differential independent variables, that equal the product of each independent variable by the dummy variable d. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within each empirical specification, (1) to (4), the first and second columns display the regression coefficient of each independent variable for noninstitutional investors and t-statistics, respectively, while the third and fourth columns display the regression coefficient of each differential independent variable (i.e. the difference between institutional and noninstitutional investors) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)				(2)				(3)				(4)			
		Noninstitutional		Institutional *vs* Noninstitutional		Noninstitutional		Institutional *vs* Noninstitutional		Noninstitutional		Institutional *vs* Noninstitutional		Noninstitutional		Institutional *vs* Noninstitutional	
Variable	Dim.	*Coef.*	*t-stat*	*Coef.*	*t-stat*	*Coef.*	*t-stat*	*Coef.*	*t-stat*	*Coef.*	*t-stat*	*Coef.*	*t-stat*	*Coef.*	*t-stat*	*Coef.*	*t-stat*
Constant		-30,501	-6,08***	5,573	1,5	-23,061	-5,70***	7,188	1,63	-31,261	-6,78***	7,380	2,03*	-24,162	-5,67***	8,745	1,99*
GDP	*it*	0,145	0,84	-0,141	-1,22	0,044	0,3	-0,095	-0,81	0,254	1,58	-0,189	-1,54	0,120	0,84	-0,130	-1,03
GDP	*jt*	1,231	14,47***	-0,119	-2,10**	0,690	7,07***	-0,109	-1,13	0,967	14,82***	-0,055	-1,05	0,635	6,25***	-0,130	-1,39
Distance	*ij*	-0,977	-7,79***	0,271	2,89***	-0,221	-1,62	0,155	1,35	-1,098	-12,08***	0,356	4,49***	-0,395	-3,45***	0,235	2,30**
Trade	*ijt*					0,710	6,47***	-0,026	-0,24					0,571	5,66***	0,024	0,27
Transparency	*jt*					0,498	9,60***	-0,296	-5,43***					0,273	8,10***	-0,206	-5,70***
Contiguity	*ij*					0,592	2,20**	-0,267	-1,23					0,891	3,80***	-0,549	-2,95***
Language	*ij*					0,811	3,48***	-0,468	-2,19**					0,334	1,65	-0,108	-0,61
Currency	*ij*					0,643	2,19**	-0,263	-0,94					0,642	2,27**	-0,244	-0,87
Capitalisation	*jt*									1,531	10,60***	-0,693	-6,52***	0,954	8,91***	-0,333	-4,78***
Return	*jt*									-0,059	-11,30***	0,027	5,27***	-0,037	-8,07***	0,018	3,99***
Correlation	*ijt*									-0,109	-0,2	-0,273	-0,47	-0,246	-0,44	-0,048	-0,08
N		7936				7933				7763				7760			
R^2		0,392				0,521				0,481				0,535			
R_a^2		0,392				0,520				0,480				0,534			
		1,950				1,731				1,745				1,651			

The results of the second empirical specification show that the positive effects of destination country transparency and common language on international equity investment are significantly stronger for noninstitutional investors than for institutional investors. The influence of the other additional information costs variables on international equity investment also tends to be stronger for noninstitutional investors than for institutional investors, although the differences are not statistically significant. Thus, information costs tend to affect more the international equity investment of noninstitutional investors relative to the international equity investment of institutional investors, which is consistent with the information cost theory and the results of Grinblatt and Keloharju (2001), De Marzo, Kaniel and Kremer (2004) and Massa and Simonov (2006).

Concerning the third empirical specification, the results indicate that the positive influence of the development of destination country equity market on international equity investment is significantly stronger for noninstitutional investors than for institutional investors. Although this result is contrary to what is expected, one might argue that more developed equity markets tend to be more structured, more liquid and with lower transaction costs (Ferreira and Miguel 2007), this way attracting specially less informed investors (i.e., noninstitutional investors).

The negative influence of the return of destination country equity market index on international equity investment is also significantly stronger for noninstitutional investors than for institutional investors. Note that both institutional and noninstitutional investors exhibit contrarian behaviour. Since this contrarian behaviour is found to be more pronounced for less sophisticated investors (i.e., noninstitutional) than for more sophisticated investors (i.e. institutional), this result supports the conclusion of Grinblatt and Keloharju (2000) that the severity of contrarian behaviour is inversely related to the degree of investors' sophistication.

In turn, the negative effect of the correlation between the returns of origin and destination countries equity market indices on international equity investment tends to be stronger for institutional than for noninstitutional investors. Thus, as expected, institutional investors tend to be more concerned with the risk diversification potential of their international equity investment than noninstitutional investors. Nevertheless, the difference is not statistically significant.

In the fourth empirical specification, which includes all variables, the differences in the determinants of international equity investment between institutional and noninstitutional investors tend to remain, although some lose their statistical significance. This is the case of destination country size and common language. In contrast, the influence of contiguity, which

was not significantly different between investors in the second empirical specification, is in this final specification statistically significant and stronger for noninstitutional than for institutional investors.

Overall, the results of the final empirical specification suggest that: the influence of origin and destination country size on international equity investment is not significantly different between institutional and noninstitutional investors; the effect of information costs (in particular, geographical distance, destination country transparency and contiguity) on international equity investment is significantly stronger for noninstitutional than for institutional investors; the effect of financial variables, namely the development and return of destination country equity market, on international equity investment is significantly stronger for noninstitutional than for institutional investors.

3.4 Robustness to the consideration of business cycles

The issue of whether the determinants of international equity investment differ according to market conditions has not yet been explored in the literature. This section tests the robustness of results to the consideration of different business cycles. Business cycles are identified according to the Centre for Economic Policy Research (CEPR). Within the period 2001-2009, the CEPR identifies one business cycle of recession[36], from the first quarter of 2008 (peak) to the second quarter of 2009 (trough). Thus, the period from 2001 to 2007 is considered to lie within a business cycle of expansion, whereas the period from 2008 to 2009 is considered to lie within a business cycle of recession[37]. For the sake of simplicity, only the results of the fourth empirical specification, which contains all independent variables, are shown.

3.4.1 Expansion cycles

Table 3.7 presents the determinants of international equity investment in business cycles of expansion (2001-2007).

[36] The CEPR Committee defines a recession as "a significant decline in the level of economic activity, spread across the economy of the euro area, usually visible in two or more consecutive quarters of negative growth in GDP, employment and other measures of aggregate economic activity for the euro area as a whole; and reflecting similar developments in most countries" (*in* http://www.cepr.org/data/dating/methodology.asp)

[37] Business cycles of expansion are formally identified between troughs and peaks; business cycles of recession are formally identified between peaks and troughs.

Table 3.7: Determinants of international equity investment in business cycles of expansion

This table presents: in model (1), the determinants of international equity investment of institutional investors, in business cycles of expansion; in model (2), the determinants of international equity investment of noninstitutional investors, in business cycles of expansion; in model (3), the differences in the determinants of international equity investment between institutional and noninstitutional investors, in business cycles of expansion. International equity investment is measured by the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)	
		Institutional		Noninstitutional		Institutional vs Noninstitutional	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-12,590	-5,19***	-22,049	-4,91***	9,460	1,90*
GDP	*it*	-0,052	-0,78	0,099	0,66	-0,150	-1,15
GDP	*jt*	0,398	4,11***	0,525	5,14***	-0,126	-1,2
Distance	*ij*	-0,091	-0,7	-0,296	-2,41**	0,206	2,05*
Trade	*ijt*	0,705	6,21***	0,632	5,87***	0,072	0,77
Transparency	*jt*	0,035	1,46	0,200	5,07***	-0,165	-3,97***
Contiguity	*ij*	0,315	1,89*	0,951	4,08***	-0,636	-2,96***
Language	*ij*	0,169	0,77	0,247	1,00	-0,079	-0,36
Currency	*ij*	0,416	1,94*	0,574	1,92*	-0,157	-0,54
Capitalisation	*jt*	0,811	7,52***	1,196	7,26***	-0,385	-3,38***
Return	*jt*	-0,012	-2,69**	-0,032	-8,01***	0,020	4,04***
Correlation	*ijt*	-0,389	-1,03	0,024	0,03	-0,414	-0,58
N		3927		1990		5917	
R^2		0,518		0,591		0,552	
R_a^2		0,516		0,589		0,551	
RMSE		1,588		1,708		1,629	

Model (1) presents the determinants of international equity investment of institutional investors in business cycles of expansion. The results show that, in business cycles of expansion, institutional investors assign higher weights to equities from more developed destination countries. In fact, destination country size exerts a positive and statistically significant influence on institutional investors' international equity investment.

Bilateral trade, contiguity and common currency also significantly contribute to enhance international equity investment of institutional investors in business cycles of expansion. Geographical distance, destination country transparency and common language also exhibit the expected sign, although they are not statistically significant.

The results concerning the financial variables suggest that, in business cycles of expansion, institutional investors also exhibit a preference towards equities from countries

with more developed equity markets, as well as towards equities with lower past returns (consistent with contrarian behaviour). Institutional investors also tend to care about risk diversification, although this effect is not statistically significant.

Thus, in business cycles of expansion, international equity investment of institutional investors is significantly determined by destination country size, information costs (namely bilateral trade, contiguity and common currency), as well as the development and the return of destination country equity market. In relation to the results obtained for the global period (2001-2009), only the transparency of destination country loses its statistical significance when business cycles of expansion are considered.

The determinants of international equity investment of noninstitutional investors in business cycles of expansion are, in turn, presented in model (2). The results show that, in business cycles of expansion, noninstitutional investors invest significantly more in equities from more developed countries. Noninstitutional investors also invest more in equities from nearby countries in business cycles of expansion, as denoted by the negative and significant influence of geographical distance on their international equity investment. The additional information costs variables also contribute to increase international equity investment, especially bilateral trade, destination country transparency, contiguity and common currency. These results emphasise the role of information costs in the determination of international equity investment of noninstitutional investors. With respect to the financial variables, the results indicate that noninstitutional investors hold more equities from countries with more developed equity markets in their portfolios, as well as they exhibit the contrarian behaviour.

In sum, the results show that, in business cycles of expansion, international equity investment of noninstitutional investors is significantly determined by destination country size, information costs (namely geographical distance, bilateral trade, destination country transparency, contiguity and common currency), as well as the development and the return of destination country equity market. In relation to the results obtained for the global period (2001-2009), there is only the need to report the change in the sign of the correlation between the returns of origin and destination countries equity market indices, although this variable remains non statistically significant. For all other variables, the results obtained in business cycles of expansion mirror those obtained in the global period.

Estimates of model (3) show the differences in the determinants of international equity investment between institutional and noninstitutional investors in business cycles of expansion. The results suggest that the influence of the size of origin and destination countries on international equity investment does not significantly differ between institutional and

noninstitutional investors, although the coefficients of these variables are slightly larger for the latter relative to the former.

For the information costs variables, the results show that, in business cycles of expansion, international equity investment of noninstitutional investors is significantly more influenced by geographical distance, destination country transparency and contiguity relative to international equity investment of institutional investors. These results are consistent with the information costs theory, according to which the international equity investment of less informed, experienced and sophisticated investors (i.e., noninstitutional) is more affected by information costs and familiarity than that of more informed, experienced and sophisticated investors (i.e., institutional).

The results also show that the positive influence of the development of destination country equity market on international equity investment is significantly stronger for noninstitutional than for institutional investors. This result is contrary to what is expected. However, it is also possible to argue that more developed equity markets should attract especially less informed investors as these markets tend to be more structured, more liquid, and with lower transaction costs (Ferreira and Miguel 2007). Moreover, the contrarian behaviour displayed by both types of investors is also more pronounced for noninstitutional than for institutional investors, thereby supporting the conclusion of Grinblatt and Keloharju (2000) that the severity of contrarian behaviour is inversely related to the degree of investors' sophistication. The results also indicate that institutional investors tend to be more concerned with the risk diversification than noninstitutional investors. In fact, in business cycles of expansion, the correlation between the returns of origin and destination equity market indices tends to have a negative (positive) influence on international equity investment of institutional (noninstitutional) investors. However, the difference is not statistically significant.

Overall, the effect of information costs (particularly, geographical distance, destination country transparency and contiguity), as well as the effects of the development and the return of destination country equity market, on international equity investment are significantly stronger for noninstitutional than for institutional investors. Thus, the results obtained in business cycles of expansion mirror those found in the global period.

3.4.2 Recession cycles

Table 3.8 presents the determinants of international equity investment in business cycles of recession (2008-2009).

Table 3.8: Determinants of international equity investment in business cycles of recession

This table presents: in model (1), the determinants of international equity investment of institutional investors, in business cycles of recession; in model (2), the determinants of international equity investment of noninstitutional investors, in business cycles of recession; in model (3), the differences in the determinants of international equity investment between institutional and noninstitutional investors, in business cycles of recession. International equity investment is measured by the weight of destination country *j* in the international equity portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Institutional		Noninstitutional		Institutional vs Noninstitutional	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-20,607	-5,37***	-29,524	-8,79***	8,917	1,89*
GDP	*it*	0,165	1,94*	0,160	1,00	0,005	0,03
GDP	*jt*	0,672	5,11***	0,810	8,43***	-0,137	-0,96
Distance	*ij*	-0,322	-2,39**	-0,490	-3,57***	0,168	0,94
Trade	*ijt*	0,433	2,63**	0,512	4,38***	-0,080	-0,4
Transparency	*jt*	0,051	1,48	0,369	10,79***	-0,318	-7,92***
Contiguity	*ij*	0,522	2,33**	0,957	2,69**	-0,434	-1,45
Language	*ij*	0,197	0,66	0,197	0,59	-0,001	0,00
Currency	*ij*	0,261	0,88	0,448	1,58	-0,187	-0,55
Capitalisation	*jt*	0,554	3,38***	0,663	4,93***	-0,109	-0,64
Return	*jt*	-0,059	-5,65***	-0,091	-6,81***	0,033	2,67**
Correlation	*ijt*	-3,221	-3,04***	0,606	0,45	-3,827	-2,88**
N		1192		651		1843	
R^2		0,443		0,611		0,526	
R_a^2		0,438		0,604		0,520	
RMSE		1,640		1,664		1,649	

Model (1) presents the determinants of international equity investment of institutional investors in business cycles of recession. The results show that the size of both origin and destination countries have a positive and significant influence on international equity investment. Hence, in business cycles of recession, institutional investors from more developed countries tend to assign higher weights to equities, especially to those from more developed countries.

The results also show that, in business cycles of recession, institutional investors assign higher weights to equities from nearby countries, as denoted by the negative and significant influence of geographical distance on international equity investment of institutional investors. Moreover, in business cycles of recession, institutional investors assign significant higher weights to equities from trade partners and from contiguous countries.

International equity investment of institutional investors is also significantly determined by all the financial variables considered. Particularly, the results indicate that, in business cycles of recession, institutional investors tend to assign significant higher weights to equities from countries with more developed equity markets, as well as to equities with lower past returns, but with higher risk diversification potential.

Overall, the results suggest that, in business cycles of recession, international equity investment of institutional investors is significantly determined by: the size of both origin and destination countries; information costs, namely geographical distance, bilateral trade and contiguity; the development, the return and the risk diversification potential of the destination country equity market. In relation to the results obtained in the global period (2001-2009), origin country size, geographical distance and the risk diversification potential of the destination country equity market gain statistical significance in business cycles of recession. In contrast, common currency and destination country transparency lose statistical significance when only business cycles of recession are considered[38].

In turn, model (2) presents the determinants of international equity investment of noninstitutional investors in business cycles of recession. The results suggest that noninstitutional investors assign significant higher weights to equities from more developed countries in business cycles of recession, as denoted by the positive and statistically significant effect of destination country size on international equity investment. The influence of origin country size on international equity investment also tends to be positive, although not statistically significant.

The results concerning the information costs variables show that geographical distance negatively and significantly affects international equity investment, indicating that noninstitutional investors tend to invest more in equities from nearby countries in business cycles of recession. The additional information costs variables (i.e., bilateral trade, destination country transparency, contiguity, common language and common currency) also positively

[38] Also, in relation to the results obtained in business cycles of expansion (2001-2007), origin country size, geographical distance and the risk diversification potential of the destination country equity market gain statistical significance in business cycles of recession. This suggests that origin country size, geographical distance and risk diversification may matter potentially more in business cycles of recession than in business cycles of expansion. This issue was addressed by testing the differences in the determinants of international equity investment of institutional investors between business cycles of expansion and of recession. The results are presented in Appendix 3.1. The results confirm the expectations. In fact, the effects of origin country size, geographical distance and risk diversification on international equity investment of institutional investors are found to be significantly higher in business cycles of recession than of expansion. In addition, the results show that the effects of destination country size and return on international equity investment of institutional investors are significantly higher in business cycles of recession, whereas the effects of bilateral trade and destination country equity market development are significantly stronger in business cycles of expansion.

affect international equity investment and, with the exception of common language and common currency, are all statistically significant. These results emphasise, once more, the role of information costs in the determination of international equity investment of noninstitutional investors.

For the financial variables, the results show that the development of destination country equity market exerts a positive and significant influence on international equity investment of noninstitutional investors in business cycles of recession, consistent with the preference for more developed equity markets. In contrast, the return on destination country equity market index has a negative and significant effect on international equity investment, supporting, once more, the contrarian behaviour of noninstitutional investors. The correlation between the returns on origin and destination country equity market indices tends to exert a positive, albeit not statistically significant, influence on international equity investment of noninstitutional investors.

Overall, the results emphasise the important role of destination country size, information costs (specifically, geographical distance, bilateral trade, destination country transparency and contiguity) and the development and return of destination country equity market in the determination of international equity investment of noninstitutional investors in business cycles of recession. In relation to the results obtained for the global period (2001-2009), only common currency loses its statistical significance in business cycles of recession. The sign of the correlation between the returns of origin and destination countries equity market indices in business cycles of recession changes, although this variable remains non statistically significant. For all other variables, the results obtained in business cycles of recession are similar to those obtained in the global period[39].

Estimates of model (3) show the differences in the determinants of international equity investment between institutional and noninstitutional investors in business cycles of recession. The results show that the effect of the size of origin and destination countries on international equity investment does not significantly differ between institutional and noninstitutional investors. Also, the negative influence of geographical distance on international equity investment does not significantly differ between institutional and noninstitutional investors, although it tends to be stronger for the latter than for the former. The positive effect of the

[39] Appendix 3.2 compares the determinants of international equity investment of noninstitutional investors in business cycles of expansion and recession, as well as presents the respective differences. The results show that the preference of noninstitutional investors for equities from more developed, more transparent and nearby countries, as well as the contrarian behaviour, are significantly more pronounced in business cycles of recession. In contrast, the preference of noninstitutional investors for more developed equity markets is significantly more pronounced in business cycles of expansion.

additional information costs variables also tends to be stronger for noninstitutional than for institutional investors. Nevertheless, differences are only statistically significant for destination country transparency. Thus, in business cycles of recession, international equity investment of noninstitutional investors is significantly more influenced by the transparency of destination country than international equity investment of institutional investors.

The results concerning the financial variables show that the positive effect of the development of destination country equity market on international equity investment does not significantly differ between institutional and noninstitutional investors, although it tends to be higher for the latter relative to the former. The results also show that the contrarian behaviour is significantly more pronounced for noninstitutional than for institutional investors. This result goes in line with the conclusion of Grinblatt and Keloharju (2000) that the severity of contrarian behaviour is inversely related to the degree of investors' sophistication. Moreover, in business cycles of recession, the influence risk diversification on international equity investment significantly differs between institutional and noninstitutional investors, being higher for the former than for the latter. In fact, as previously noticed, the correlation between the returns of origin and destination countries equity market indices has a negative (positive) influence on the international equity investment of institutional (noninstitutional) investors. This result clearly indicates that institutional investors are significantly more concerned with risk diversification than noninstitutional investors.

Overall, in business cycles of recession, only the effect of destination country transparency, as well as the effects of the return and risk diversification potential of destination country equity market, significantly differ between institutional and noninstitutional investors. In particular, the preference for equities from more transparent countries is more pronounced in noninstitutional than in institutional investors, as well as is the contrarian behaviour. In contrast, the preference for equities with higher risk diversification potential is more pronounced in institutional than in noninstitutional investors. Hence, this result reinforces the argument that international equity investment decisions of more informed, experienced and sophisticated investors are less influenced by information costs and familiarity and, at least in business cycles of recession, more influenced by financial concerns.

In relation to the results obtained for the global period (2001-2009), the differences between both types of investors at the level of geographical distance, contiguity and destination country equity market development lose their statistical significance in business cycles of recession. In contrast, the difference between both types of investors at the level of

destination country risk diversification potential gains statistical significance in business cycles of recession.

3.5 Conclusion

The objectives of this chapter were threefold. First, to analyse the determinants of international equity investment of institutional investors. Second, to analyse the determinants of international equity investment of noninstitutional investors. Third, to compare the determinants of international equity investment between institutional and noninstitutional investors. For this purpose, a gravity-model was applied to the international equity investment of institutional and noninstitutional investors from 20 countries from OECD, during the period 2001-2009. Additionally, the robustness of results to the consideration of different business cycles was also verified.

The results suggest the importance of destination country size and information costs in the determination of international equity investment of both institutional and noninstitutional investors, thereby corroborating the results of previous empirical studies (e.g. Faruquee, Li and Yan 2004, Lane and Milesi-Ferretti 2008). The results also emphasise the importance of the development and return of destination country equity market in the determination of international equity investment of both institutional and noninstitutional investors. Curiously, both exhibit a contrarian behaviour.

Furthermore, the results show that there are significant differences in the determinants of international equity investment between institutional and noninstitutional investors, namely within information costs and financial variables. In particular, noninstitutional investors tend to exhibit a more pronounced preference for equities from geographical nearby, contiguous and more transparent countries than institutional investors. This result suggests that the effect of information costs on international equity investment is significantly stronger for less informed, experienced and sophisticated investors than for more informed, experienced and sophisticated investors, thereby supporting the information costs theory and the studies of Grinblatt and Keloharju (2001), De Marzo, Kaniel and Kremer (2004) and Massa and Simonov (2006). Moreover, the preference for more developed equity markets is also significantly more pronounced in noninstitutional than in institutional investors, which can be explained by the fact that more developed equity markets are usually more structured, more liquid and with lower transaction costs. The contrarian behaviour is also significantly more severe for noninstitutional than for institutional investors. Since noninstitutional investors are

less sophisticated than institutional investors, this result supports the conclusion of Grinblatt and Keloharju (2000) that the severity of contrarian behaviour is inversely related to the degree of investors' sophistication.

The analysis of the determinants of international equity investment in different business cycles provided interesting results. In business cycles of recession, the preference for equities from more transparent countries is significantly more pronounced in noninstitutional than in institutional investors, as well as is the contrarian behaviour. In contrast, the preference for equities with higher risk diversification potential is significantly more pronounced in institutional than in noninstitutional investors. Thus, institutional and noninstitutional investors react differently to business cycles of recession: while the former tend to privilege more equities that allow for higher risk diversification, the latter tend to privilege more equities from more transparent countries in their portfolios. This result reinforces the argument that international equity investment decisions of more informed, experienced and sophisticated investors are less influenced by information costs and familiarity and, at least in business cycles of recession, more influenced by financial concerns.

The empirical analysis carried out in this chapter offers important contributions to the literature. First, this is the first investigation on the determinants of international equity investment considering both institutional and noninstitutional investors. This allows the analysis to be detached from the hypothesis of homogeneity of preferences between institutional and noninstitutional investors, which underlies studies that use aggregated data for all investors within each investment origin country. Moreover, and more importantly, this allows for the comparison of the determinants of international equity investment between institutional and noninstitutional investors. This issue has not been addressed by previous studies, as they either consider all investors aggregately (e.g. Ferreira and Miguel 2007, Lane and Milesi-Ferretti 2008) or consider just one type of investor, such as mutual funds (e.g. Aggarwal, Klapper and Wysocki 2005, Chan, Covrig and Ng 2005) or households (e.g. Bailey, Kumar and Ng 2008, Kyrychenko and Shum 2006). In fact, the results are relevant in the sense that they suggest that there are significant differences in the determinants of international equity investment between institutional and noninstitutional investors and, therefore, the heterogeneity of institutional and noninstitutional investors in international equity investment is not negligible. As such, this research draws attention to the need for disaggregating the analysis of the determinants of international equity investment by type of investor, in order to account for differences in investors' preferences.

Second, the influence of business cycles in the determinants of international equity investment is also taken into account. This has not been addressed by previous studies, since they only consider one year (e.g. Faruqee, Li and Yan 2004; Lane and Milesi-Ferretti 2008), two years (e.g. Chan, Covrig and Ng 2005, Berkel 2007), or three or more discontinuous years of investment analysis (e.g. Ferreira and Miguel 2007, Mishra 2007). In fact, based on a continuous 9 year period of data, the results show that the determinants of international equity investment are influenced by business cycles. Thus, the disaggregation of data by business cycles is relevant and must not be neglected.

Appendices

Appendix 3.1
Determinants of international equity investment of institutional investors by business cycles

This table presents: in model (1), the determinants of international equity investment of institutional investors in business cycles of expansion; in model (2), the determinants of international equity investment of institutional investors in business cycles of recession; in model (3), the differences in the determinants of international equity investment of institutional investors between business cycles of recession and business cycles of expansion. International equity investment is measured by the weight of destination country *j* in the international equity portfolio held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown is the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for business cycles of recession and zero for business cycles of expansion) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the *Root Mean Squared Error* (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)	
		Expansion		Recession		Recession vs Expansion	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-12,590	-5,19***	-20,607	-5,37***	-8,017	-2,94***
GDP	*it*	-0,052	-0,78	0,165	1,94*	0,216	4,30***
GDP	*jt*	0,398	4,11***	0,672	5,11***	0,274	2,09*
Distance	*ij*	-0,091	-0,7	-0,322	-2,39**	-0,232	-2,10**
Trade	*ijt*	0,705	6,21***	0,433	2,63**	-0,272	-1,95*
Transparency	*jt*	0,035	1,46	0,051	1,48	0,016	0,48
Contiguity	*ij*	0,315	1,89*	0,522	2,33**	0,207	1,31
Language	*ij*	0,169	0,77	0,197	0,66	0,028	0,14
Currency	*ij*	0,416	1,94*	0,261	0,88	-0,156	-1,1
Capitalisation	*jt*	0,811	7,52***	0,554	3,38***	-0,257	-1,90*
Return	*jt*	-0,012	-2,69**	-0,059	-5,65***	-0,046	-5,35***
Correlation	*ijt*	-0,389	-1,03	-3,221	-3,04***	-2,832	-3,28***
N		3927		1192		5119	
R^2		0,518		0,443		0,502	
R_a^2		0,516		0,438		0,499	
RMSE		1,588		1,640		1,600	

Appendix 3.2
Determinants of international equity investment of noninstitutional investors by business cycles

This table presents: in model (1), the determinants of international equity investment of noninstitutional investors in business cycles of expansion; in model (2), the determinants of international equity investment of noninstitutional investors in business cycles of recession; in model (3), the differences in the determinants of international equity investment of noninstitutional investors between business cycles of recession and business cycles of expansion. International equity investment is measured by the weight of destination country *j* in the international equity portfolio held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown is the first column. A detailed description of independent variables is provided in table 3.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for business cycles of recession and zero for business cycles of expansion) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the *Root Mean Squared Error* (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Expansion		Recession		Recession vs Expansion	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-22,049	-4,91***	-29,524	-8,79***	-7,475	-2,38**
GDP	*it*	0,099	0,66	0,160	1,00	0,061	0,55
GDP	*jt*	0,525	5,14***	0,810	8,43***	0,285	3,05***
Distance	*ij*	-0,296	-2,41**	-0,490	-3,57***	-0,194	-1,76*
Trade	*ijt*	0,632	5,87***	0,512	4,38***	-0,120	-1,36
Transparency	*jt*	0,200	5,07***	0,369	10,79***	0,170	4,17***
Contiguity	*ij*	0,951	4,08***	0,957	2,69**	0,005	0,02
Language	*ij*	0,247	1,00	0,197	0,59	-0,050	-0,13
Currency	*ij*	0,574	1,92*	0,448	1,58	-0,126	-0,98
Capitalisation	*jt*	1,196	7,26***	0,663	4,93***	-0,533	-3,17***
Return	*jt*	-0,032	-8,01***	-0,091	-6,81***	-0,059	-4,83***
Correlation	*ijt*	0,024	0,03	0,606	0,45	0,582	0,66
N		1990		651		2641	
R^2		0,591		0,611		0,596	
R_a^2		0,589		0,604		0,592	
RMSE		1,708		1,664		1,697	

Chapter 4: The determinants of international bond investment: do they differ between institutional and noninstitutional investors?

4.1 Introduction

This chapter analyses and compares the determinants of international bond investment of institutional and noninstitutional investors.

In spite of the importance of bonds for international diversification of investment portfolios (e.g. Levy and Lerman 1988, Jorion 1991, Levich and Thomas 1993), empirical studies on the determinants of international bond investment are quite limited. In fact, the majority of empirical studies in this area have focused on the determinants of international equity investment. Moreover, the few existing studies do not provide a comparison of the determinants of international bond investment between different types of investors, since they make use of aggregated data for all investors within each origin country (e.g. De Santis and Gérard 2006, Coeurdacier and Martin 2007, Ferreira and Miguel 2011) or they consider disaggregated data for only one type of investor, such as households (e.g. Kyrychenko and Shum 2006).

In this context, it is reasonable to question whether international bond investment of institutional and noninstitutional investors is motivated by the same factors and whether the importance attributed to each factor is similar. Based on the information costs theory, one should expect that international bond investment of institutional investors is more motivated by financial concerns (such as return and risk diversification) and less influenced by information costs and familiarity relative to international bond investment of noninstitutional investors. In fact, the studies of Grinblatt and Keloharju (2001), De Marzo, Kaniel and Kremer (2004) and Massa and Simonov (2006) suggest that more (less) informed, experienced and sophisticated investors are less (more) affected by information costs and familiarity.

The objectives of this chapter are threefold. First, to investigate the determinants of international bond investment of institutional investors. Second, to investigate the determinants of international bond investment of noninstitutional investors. Third, to investigate the differences in the determinants of international bond investment between institutional and noninstitutional investors. For this purpose, a gravity-model is applied to the international bond investment of institutional and noninstitutional investors from 20 OECD countries, at the end of years 2001 to 2009. Additionally, the robustness of results to the consideration of different business cycles is also tested.

This chapter offers important contributions to the literature. First, by considering simultaneously institutional and noninstitutional investors, it is possible to compare the determinants of international bond investment between investors with different degrees of information, experience and sophistication. This issue has not been addressed by previous studies, as they either considered all types of investors aggregately (e.g. Coeurdacier and Martin 2007, De Santis and Gérard 2006, Ferreira and Miguel 2011) or just one type of investor (e.g. Kyrychenko and Shum 2006). Moreover, the analysis of the determinants of international bond investment is exempt from the hypothesis of homogeneity of preferences between institutional and noninstitutional investors, which underlies studies that use aggregated data for all investors within each investment origin country. Second, by using a continuous 9 year period of data, the influence of business cycles in the determinants of international bond investment is also taken into account. This issue has not been addressed by previous studies, since they only consider one year (e.g. Honohan and Lane 2000, Coeurdacier and Martin 2007), two years (e.g. De Santis and Gérard 2006, Mishra and Daily 2006), or three or more discontinuous years of investment analysis (e.g. Kyrychenko and Shum 2006, Daude and Fratzner 2008, Ferreira and Miguel 2011).

This chapter is organised as follows. Section 2 presents the research design, namely the sample, variables and estimation procedures. Section 3 presents and discusses the empirical results. Section 4 analyses the robustness of empirical findings to the consideration on different business cycles. Finally, section 5 concludes.

4.2 Research design

4.2.1 Sample

The empirical analysis is based on international portfolio investment holdings data disclosed by the Coordinated Portfolio Investment Survey (CPIS) of the International Monetary Fund (IMF). The CPIS data can be disaggregated by: type of asset; sector of the asset holder; country of residence of the asset holder; country of residence of the asset issuer; and year of investment.

According to the type of asset, the CPIS breaks down international portfolio investment holdings by equity securities, long-term debt securities and short-term debt securities. Given the objective of this study, only holdings on long-term debt securities (hereafter, bonds) are considered.

According to the sector of the asset holder (hereafter, type of investor), the CPIS breaks down international portfolio investment holdings by monetary authorities, banks, other financial institutions (including insurance companies, mutual funds and others), government, and nonfinancial sector (including nonfinancial companies, households and others). Given the objective of this study, only holdings of banks and other financial institutions (institutional investors) and holdings of nonfinancial sector (noninstitutional investors) are considered. Monetary authorities and government are thus excluded from the sample.

As for the country of residence of the asset holder (hereafter, investment origin country) and country of residence of the asset issuer (hereafter, investment destination country), the CPIS considers several countries. However, taking into account the availability of data on other variables, only OECD countries are considered. Among these, Luxembourg[40], as well as countries that become members of OECD in 2010 (Chile, Estonia, Israel and Slovenia)[41] are excluded. International bond investment holdings by sector of the holder are not available for Belgium, Canada, Iceland, Ireland, Korea, Poland, Slovak Republic, Switzerland and United States and, as such, these countries are also excluded from the sample of investment origin countries.

Therefore, the sample of investment origin countries comprises 20 OECD countries, namely Australia, Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey and United Kingdom. In turn, the sample of investment destination countries comprises 29 OECD countries, namely Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

Concerning the years of investment, data on international bond investment holdings is available, on a yearly basis, for 1997 and from 2001 onwards. In this study, a continuous 9 year period is considered, namely from 2001 to 2009[42].

[40] Lane and Milesi-Ferretti (2008) also excluded off-shore financial centres, such as Luxembourg. They argue that off-shore financial centres "act as pure intermediaries and are neither true sources nor final destinations of investment" Milesi-Ferretti (2008, pp. 543).

[41] These countries were excluded since they were not members of OECD in the time period under analysis (2001-2009).

[42] At the time of the last data collection, 2009 was the last year of available CPIS data.

4.2.2 Variables

The dependent and independent variables are defined on the basis of the existing theoretical and empirical literature on international portfolio investment, reviewed in the second chapter.

International bond investment is measured by the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* at the end of year *t*, calculated as in equation 4.1:

$$w_{kijt} = \frac{H_{kijt}}{\sum_{j=1}^{29} H_{kijt}} . 100 \quad \textbf{(4.1)}$$

Where w_{kijt} is the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* at the end of year *t*; H_{kijt} is the value of destination country *j* bonds held by investor *k* of origin country *i* at the end of year *t*. Data is from CPIS IMF. In the computation of the dependent variables, international bond holdings reported as unavailable, confidential, zero value or negative values (short-selling) were excluded.

According to the theoretical framework developed by Martin and Rey (2004) in the context of applying gravity-models in the analysis of international portfolio investment, three groups of independent variables are considered: (1) size variables; (2) information costs variables; (3) financial variables.

The first group of variables includes the size of both origin and destination countries as measured by GDP. More precisely, it considers the GDP of origin country *i* in year *t* and the GDP of destination country *j* in year *t*. Data is collected from the World Bank. It is expected that the size of both origin and destination countries positively affect international bond investment, as documented by Coeurdacier and Martin (2007).

The second group of variables includes the distance between origin and destination countries, as well as additional information costs variables, such as bilateral trade, transparency, contiguity, common language and common currency.

Distance between origin and destination countries has been traditionally used as a proxy for transaction and information costs. In fact, there is evidence that international bond investment is negatively and significantly affected by distance (e.g. Portes, Rey and Oh 2001, Coeurdacier and Martin 2007, Daude and Fratzner 2008, Ferreira and Miguel 2011, Aggarwal, Kearney and Lucey 2012). According to Portes, Rey and Oh (2001), the observed negative relationship between distance and international bond investment can be explained by

information costs: “countries which are near each other tend to know much more about each other, either because of direct interaction between their citizens for tourism or business, or because of better media coverage, or because they tend to learn each other's languages” (Portes, Rey and Oh, 2001, pp. 784).

In this study, distance between origin and destination countries is measured by the geographical distance between the capital city of origin country *i* and the capital city of destination country *j*. Data is obtained from the Geodesic Distance Database of the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). It is expected that geographical distance negatively affects international bond investment. As a measure of information costs, and to some extent, of the degree of familiarity between origin and destination countries, it is also expected that the negative effect of geographical distance on international bond investment is stronger for noninstitutional investors than for institutional investors.

Bilateral trade between origin and destination countries is included since it also might contribute to reduce information costs and thereby enhance international bond investment. Aviat and Coeurdacier (2007) find that trade in the goods market reduces information costs in the financial markets (and vice versa) and, hence, international asset holdings are strongly affected by international trade patterns. Portes and Rey (2005), Lane and Milesi-Ferretti (2008) and Diyarbakirlioglu (2011) also underline the importance of bilateral trade for reducing information costs. Although these studies are mainly focused on international equity investment, a similar conclusion can be taken for international bond investment. In fact, De Santis and Gérard (2006) and Coeurdacier and Martin (2007) find that bilateral trade is an important determinant of international bond investment, which is consistent with the potential of bilateral trade for reducing information costs. In this study, bilateral trade is measured by the weight of destination country *j* on total trade (imports plus exports) of origin country *i* in year *t*. Data is from United Nation’s Commodity Trade Statistics (COMTRADE).

The transparency of investment destination country is also considered as an information costs variable. Diyarbakirlioglu (2011) argues that more transparency implies less (perceived) risk and/or low information costs, thereby encouraging investors to invest more in more transparent countries. Indeed, Coeurdacier and Martin (2007) and Daude and Fratzner (2008) find that international bond investment is positive and significantly affected by transparency. In this study, the transparency of destination country *j* in year *t* is assessed by the Corruption Perception Index (CPI), from Transparency International. The CPI evaluates the perception of corrupt practices in both public and private sectors, scoring countries on a scale from 0 (highly corrupt) to 10 (very clean).

A set of dummies for contiguity, common language and common currency is also included to capture information costs.

Contiguity is a dummy that equals one if origin country *i* and destination country *j* are geographically contiguous. Contiguity is included since it is expected that information flows, and hence, international bond investment is more intense between neighbour countries. Similarly, common language is included since it is expected that common language significantly reduces the cost of gathering, interpreting and comparing information, as suggested by Faruquee, Li and Yan (2004). In fact, several empirical studies present evidence of a positive and significant relationship between common language and international bond investment (e.g. Coeurdacier and Martin 2007, Daude and Fratzner 2008, Ferreira and Miguel 2011, Aggarwal, Kearney and Lucey 2012). Common language is a dummy that equals one if origin country *i* and destination country *j* share the same official language. Data on contiguity and common language is collected from the Geodesic Distance database from CEPII.

Common currency is included since it is expected that a common currency will reduce the transaction and information costs, thereby enhancing international bond investment. From the origin and destination countries included in the sample only members of European Monetary Union (EMU) share the same currency – the euro. Coeurdacier and Martin (2007) find that the euro has contributed to decrease transaction costs and, hence, increase international bond investment within euro zone. De Santis and Gérard (2006) also presents evidence that euro area investors assign higher portfolio weights to assets from euro area countries. Common currency is a dummy that equals one if origin country *i* and destination country *j* share the same currency and is constructed on the basis of the information provided by The World Factbook of Central Intelligence Agency (CIA).

Bilateral trade, transparency, contiguity, common language and common currency should positively affect international bond investment in so far as these variables reflect lower information costs and greater familiarity between investment origin and destination countries. For the same reason, the positive effect of these variables on international bond investment should be stronger for noninstitutional than for institutional investors.

The third group of variables includes financial variables that capture the development, return and the risk diversification potential of destination country bond market.

The development of destination country bond market is included since more developed markets tend to be more structured, more liquid and with lower transaction costs (Ferreira and Miguel 2011). In fact, Coeurdacier and Martin (2007) and Aggarwal, Kearney and Lucey (2012) show that the development of destination country bond market has a positive and

significant impact on international bond investment. In this study, the development of destination country bond market is measured by the ratio between the bond market capitalisation and the GDP of destination country *j* in year *t*. Data on bond market capitalisation is from the Bank for International Settlements (BIS) Quarterly Review and is calculated by the sum of the market value of domestic and international bonds[43]. Data on GDP is obtained from the World Bank.

The return on destination country bond market is included to evaluate the return chasing behaviour of investors and is proxied by the annualised mean of monthly yields on long-term government bonds[44] of destination country *j* over a five years period (including the year *t*). Data on monthly returns is from OECD statistics. According to the return chasing behaviour hypothesis (e.g. Bohn and Tesar 1996, Froot, O'Connell and Seasholes 2001, Brennan, Cao, Strong and Xu 2005), it is expected that international bond investment is positively affected by destination country bond market return. Empirical studies have supported this hypothesis (e.g. De Santis and Gérard 2006, Ferreira and Miguel 2011).

The risk diversification potential of destination country bond market is proxied by the correlation coefficient between the monthly yields on long-term government bonds of origin country *i* and the monthly yields on long-term government bonds of destination country *j* over a five year period (including year *t*). Return correlation is expected to be negatively related to international bond investment, since the higher the return correlation, the lower the risk diversification potential (Solnik 1974a). Nevertheless, De Santis and Gérard (2006) and Ferreira and Miguel (2011) find a positive relationship between return correlation and international bond investment.

Table 4.1 summarises the dependent and independent variables used in this study, while tables 4.2 and 4.3 present, respectively, the descriptive statistics and the correlation matrix.

[43] As in Sorensen, Wu, Yosha and Zhu (2007), the market value of domestic bonds is calculated by the difference between the market value of outstanding domestic debt securities (table 16A from BIS Quarterly Review) and the market value of outstanding short term domestic debt securities (table 17A from BIS Quarterly Review). The market value of international bonds is given by the market value of outstanding international bonds and notes (table 14B from BIS Quarterly Review).

[44] According to OECD, the yield on long term government bonds is calculated at the pre-tax level and before deductions for brokerage costs and commissions and is derived from the relationship between the present market value of the bond and that at maturity, taking into account also interest payments paid through to maturity.

Table 4.1: Determinants of international bond investment: dependent and independent variables

This table presents the dependent and independent variables used to investigate the determinants of international bond investment. The first column presents the category of the dependent or independent variable. The second column presents the variable(s) used within each category. The third column presents the dimension of each variable (i.e., if it varies at the level of each investor *k*, origin country *i*, destination country *j* and/or year of investment *t*). The fourth column presents a description of the variable, particularly the way it is measured. Finally, the fifth column presents the data source.

Category	Variable	Dim.	Description	Data Source
International Bond Investment	Investment	*kijt*	Weight of destination country *j* in international bond portfolio of investor *k* of origin country *i* in year *t* (natural logarithm)	CPIS IMF
Size	GDP	*it*	Origin country *i* GDP in year *t* (natural logarithm)	World Bank
	GDP	*jt*	Destination country *j* GDP in year *t* (natural logarithm)	World Bank
Information Costs	Distance	*ij*	Geographical distance between the capital city of origin country *i* and destination country *j* (natural logarithm)	CEPII
	Trade	*ijt*	Weight of destination country *j* in total trade (imports plus exports) of origin country *i* in year *t* (natural logarithm)	COMTRADE
	Transparency	*jt*	Corruption Perceptions Index that scores, in year t, destination country *j* on a scale from 0 (highly corrupt) to 10 (very clean), on the basis of perception of corrupt practices in both public and private sectors	Transparency International
	Contiguity	*ij*	Dummy variable that equals one if origin country *i* and destination country *j* are geographically contiguous	CEPII
	Language	*ij*	Dummy variable that equals one if origin country *i* and destination country *j* share the same official language	CEPII
	Currency	*ijt*	Dummy variable that equals one if origin country *i* and destination country *j* share the same currency	CIA World Factbook
Bond Market Development	Capitalisation	*jt*	The ratio between bond market capitalisation of destination country *j* in year *t* and destination country *j* GDP in year *t* (natural logarithm)	BIS World Bank
Return	Return	*jt*	Annualised mean of monthly yields on long-term government bonds of destination country *j* over a 5 years period (including year *t*)	OECD
Diversification	Correlation	*ijt*	Correlation coefficient between the monthly yields on long-term government bonds of origin country *i* and destination country *j* over a 5 years period (including year *t*)	OECD

Table 4.2: Determinants of international bond investment: descriptive statistics

This table presents the descriptive statistics relative to the dependent and independent variables used to investigate the determinants of international bond investment. The first column presents the variables. The second column presents the dimension of each variable (i.e., if it varies at the level of each investor *k*, origin country *i*, destination country *j* and/or year of investment *t*). The third to seventh columns present the number of observations, the mean, the standard deviation, the minimum and the maximum value of each variable, respectively. For a detailed description of independent variables please see table 4.1.

Variable	Dim.	Obs.	Mean	Std.Dev.	Min.	Max.
Investment	*kijt*	8441	-0,143	2,301	-9,732	4,605
GDP	*it*	8441	27,120	1,152	24,697	29,247
GDP	*jt*	8441	27,010	1,396	22,793	30,291
Distance	*ij*	8441	7,715	1,100	4,088	9,883
Trade	*ijt*	8441	0,279	1,450	-6,705	4,313
Transparency	*jt*	8441	7,236	1,874	3,100	9,900
Capitalisation	*jt*	8441	4,566	0,695	2,769	6,535
Return	*jt*	8209	5,002	1,831	1,287	19,763
Correlation	*ijt*	8033	0,672	0,346	-0,754	0,999

Table 4.3: Determinants of international bond investment: correlation matrix

This table presents the correlation matrix relative to the independent variables used to investigate the determinants of international bond investment. The first column presents the variables. The second column presents the dimension of each variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). The remaining columns present the correlation coefficient between each pair of variables. For a detailed description of independent variables please see table 4.1.

Variable	**Dim.**	GDP	GDP	Distance	Trade	Transp.	Cap.	Return	Corr.
GDP	*it*	1							
GDP	*jt*	-0,072	1						
Distance	*ij*	0,198	0,179	1					
Trade	*ijt*	-0,144	0,635	-0,499	1				
Transparency	*jt*	-0,052	-0,034	0,026	0,018	1			
Capitalisation	*jt*	-0,067	0,139	-0,103	0,158	0,377	1		
Return	*jt*	0,034	-0,393	0,158	-0,401	-0,318	-0,292	1	
Correlation	*ijt*	-0,075	-0,068	-0,405	0,259	0,173	0,057	-0,246	1

From the descriptive statistics table, it is possible to see that the mean weight of each destination country in investors' international bond portfolio is -0,143 (corresponding to 4,90% in the variable original values). The average GDP of origin countries included in the sample is 27,120 (corresponding to $1{,}13 \times 10^{12}$ US dollars), with Japan (New Zealand) presenting the highest (lowest) GDP in the sample period. The average GDP of destination countries included in the sample is 27,010 (corresponding to $1{,}44 \times 10^{12}$ US dollars), with USA (Iceland) presenting the highest (lowest) GDP in the sample period.

The geographical distance between the capital cities of origin and destination countries in the sample is, on average, 7,715 (4042 km), with a minimum of 4,088 (60 km) between Vienna and Bratislava and a maximum of 9,883 (19586 km) between Madrid and Wellington. On average, the weight of destination country in total trade of origin country is 0,279 (3,24%), with a minimum of -6,705 (0,0012%), between Mexico and Iceland, and a maximum of 4,313 (74,65%), between México and USA. The CPI score of destination countries in the sample is, on average, 7, with Finland (Mexico) presenting the highest (lowest) transparency.

In relation to the development, return and risk diversification potential of the destination country bond market, it is possible to observe that: on average, the bond market capitalisation scaled by GDP of destination countries included in the sample is 4,566 (123%), with Iceland (Czech Republic) being the destination country with the most (less) developed bond market; the return on long-term government bonds of destination countries included in the sample is, on average, 5%, with Mexican (Japanese) bonds showing the highest (lowest) returns; the average correlation coefficient between the return on long-term government bonds of origin countries and of destination countries in the sample is 0,67, with Germany and

France and Portugal and Spain having the highest correlation and Norway and Mexico the lowest correlation.

From the correlation matrix presented in table 4.3, it is possible to see that there is a moderate correlation between bilateral trade and destination country GDP (0,635). This finding was expected since the gravitational model is also used to explain bilateral trade patterns and therefore destination country GDP also emerges as an important determinant. Thus, the simultaneous consideration of these variables can create problems of multicolinearity. This potential problem will be considered by reporting mean variance inflation factor (VIF) in individual regressions.

4.2.3 Estimation

To estimate the determinants of international bond investment of both institutional and noninstitutional investors, separate OLS regressions are run for each type of investor. This allows to identify the importance and significance of each independent variable in the determination of international bond investment of institutional investors and of noninstitutional investors.

The estimation procedure can be represented by equation 4.2:

$$ln(w_{kijt}) = \alpha + \beta . X_{ijt} + v_{kijt} \quad \textbf{(4.2)}$$

Where w_{kijt} is the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* at the end of year *t* (calculated as in equation 4.1); α is a constant; X_{ijt} is a vector of independent variables (fully described in the previous subsection); and v_{kijt} are cluster-robust standard errors[45], with $v_{kijt} = \mu_i + \varepsilon_{kijt}$.

Within this estimation procedure, four empirical specifications are proposed[46]. The first empirical specification considers the traditional gravitational variables, i.e., the size of both origin and destination countries and the distance between them. The second empirical specification considers, besides the traditional gravitational variables, the additional information costs variables, namely bilateral trade, transparency, contiguity, common language and common currency. The third empirical specification considers, besides the traditional gravitational variables, the financial variables, namely the development, return and

[45] The cluster is defined at the level of each origin country *i*, since investors are clustered within each origin country.
[46] The four empirical specifications only differ with respect to the independent variables included in the vector X_{ijt} of equation 4.2.

risk diversification potential of destination country bond market. Finally, the fourth empirical specification considers simultaneously all variables.

To compare the determinants of international bond investment between institutional and noninstitutional investors, a single pooled OLS regression for both types of investors is run. This regression includes: a set of independent variables; a dummy d, that equals one for institutional investors and zero for noninstitutional investors; differential independent variables, that equal the product of each independent variable by the dummy d.

The estimation procedure is represented by equation 4.3:

$$ln(w_{kijt}) = \alpha + d + \beta.X_{ijt} + \beta'.X_{ijt}.d + v_{kijt} \quad \textbf{(4.3)}$$

Where w_{kijt} is the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* at the end of year *t* (calculated as in equation 4.1); α is a constant; d is a dummy that equals one for institutional investors and zero for noninstitutional investors; X_{ijt} is a vector of independent variables (fully described in the previous subsection); and v_{kijt} are cluster-robust standard errors, with $v_{kijt} = \mu_i + \varepsilon_{kijt}$.

This estimation procedure allows to compare the coefficient of each independent variable between institutional and noninstitutional investors, as well as to present the statistical significance of the difference[47], as follows: α and β represent the intercept (constant) and the coefficient of each independent variable for the omitted group, i.e., noninstitutional investors, while d and β' represent the difference in the intercept and in the coefficient of each independent variable between institutional and noninstitutional investors.

4.3 Empirical results

4.3.1 The determinants of international bond investment: institutional investors

Table 4.4 presents the determinants of international bond investment of institutional investors.

[47] This procedure is similar to the statistical test proposed by Cohen (1983) for comparing regression coefficients across subsamples.

Table 4.4: Determinants of international bond investment of institutional investors

This table presents the determinants of international bond investment of institutional investors in the period 2001-2009. International bond investment is measured by the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). Independent variables are shown in the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). For each independent variable, the regression coefficient, t-statistics and the respective statistical significance are displayed. The estimation is based on a OLS regression with cluster-robust standard errors, at the level of each origin country *i*. The last six lines present: the number of observations (N); F-statistics and the statistical significance for the model; the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); the Root Mean Squared Error (RMSE); and the Variance Inflation Factor (VIF). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)		(4)	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-16,932	-5,39***	-9,765	-3,55***	-25,985	-9,39***	-15,990	-6,90***
GDP	*it*	-0,060	-0,79	-0,076	-0,81	-0,0002	-0,00	-0,041	-0,49
GDP	*jt*	0,884	18,23***	0,386	6,65***	0,864	28,34***	0,375	5,40***
Distance	*ij*	-0,692	-9,85***	-0,099	-0,77	-0,556	-6,85***	-0,018	-0,14
Trade	*ijt*			0,618	6,00***			0,642	7,18***
Transparency	*jt*			0,242	5,68***			0,104	2,43**
Contiguity	*ij*			-0,118	-0,74			0,187	0,89
Language	*ij*			-0,341	-0,70			-0,208	-0,52
Currency	*ij*			1,145	5,25***			0,793	4,21***
Capitalisation	*jt*					1,215	13,34***	1,054	14,28***
Return	*jt*					0,161	3,89***	0,192	4,66***
Correlation	*ijt*					0,885	3,77***	0,320	1,81*
N		5916		5916		5697		5697	
F		250,66***		114,36***		191,73***		191,09***	
R^2		0,365		0,500		0,523		0,589	
R_a^2		0,365		0,499		0,522		0,588	
RMSE		1,783		1,584		1,526		1,417	
Mean VIF		1,06		2,30		1,24		2,22	

The first empirical specification considers the size of origin and destination countries and distance between them as determinants of international bond investment of institutional investors. The results show that the traditional gravitational variables perform relatively well, as approximately 37% of the variability of institutional investors' international bond investment is explained by the model. Origin country size exerts a negative, albeit not statistically significant, influence on international bond investment of institutional investors. In turn, destination country size affects positively and significantly international bond investment of institutional investors, which is in line with the results of Coeurdacier and Martin (2007). The distance between origin and destination countries affects, as expected, negatively and significantly international bond investment of institutional investors, thereby supporting the results of previous empirical studies (e.g. Coeurdacier and Martin 2007, Daude and Fratzner 2008, Ferreira and Miguel 2011, Aggarwal, Kearney and Lucey 2012). Hence, institutional investors exhibit a preference towards bonds from more developed and nearby countries.

The second empirical specification includes the additional information costs variables, namely bilateral trade, transparency, contiguity, common language and common currency. These variables have high explanatory power as they contribute to increase the percentage of international bond investment variability explained by the model from 37% to 50%.

As expected, bilateral trade between origin and destination countries exerts a positive and significant effect on international bond investment of institutional investors. This result demonstrates the potential of bilateral trade for reducing information costs between countries and supports the results of previous empirical studies (e.g. De Santis and Gérard 2006, Coeurdacier and Martin 2007). It should be noted that the introduction of bilateral trade reduces the size of the coefficients of destination country size and of geographical distance[48], but only the latter loses its statistical significance. This result goes in line with the conclusion of Aviat and Coeurdacier (2007) that "a large part of the impact of physical distance on bilateral asset holdings goes through its impact on trade" (Aviat and Coeurdacier, 2007, pp. 36).

Destination country transparency also affects positively and significantly international bond investment of institutional investors, suggesting that information costs are lower in more transparent countries. Thus, institutional investors prefer to hold bonds from more transparent countries, consistent the results of Coeurdacier and Martin (2007) and Daude and Fratzner (2008).

From the three dummies considered – contiguity, common language and common currency – only the latter affects positively and significantly international bond investment of institutional investors. Hence, institutional investors exhibit a preference towards bonds from countries that share the same currency (euro), which is in accordance with the results of De Santis and Gérard (2006) and Coeurdacier and Martin (2007). Curiously, contiguity and common language tend to have a negative, although not statistically significant, influence on international bond investment.

The third empirical specification considers the financial variables, namely the development, return and risk diversification potential of destination country bond market. These variables contribute to increase the percentage of international bond investment variability explained by the model from 37% to 52%. Moreover, these variables are all statistically significant, exerting a positive influence on international bond investment of institutional investors.

[48] This is probably due to the correlation between these variables. Nevertheless, the mean VIF is within acceptable values, not reflecting multicolinearity problems in the regression.

Hence, institutional investors assign significant higher weights to bonds from countries with more developed bond markets in their portfolios, thereby supporting the results of Coeurdacier and Martin (2007) and Aggarwal, Kearney and Lucey (2012). Institutional investors also hold more bonds with higher past returns, which is consistent with the return chasing behaviour and with results found by De Santis and Gérard (2006) and Ferreira and Miguel (2011). Moreover, institutional investors exhibit a preference towards foreign bonds whose yields are more correlated with domestic bond yields. This result runs against the risk diversification hypothesis. Nonetheless, it was also found by De Santis and Gérard (2006) and Ferreira and Miguel (2011).

Finally, the fourth empirical specification considers all variables, explaining 59% of institutional investors' international bond investment variability. The coefficients of independent variables tend to maintain the sign and the statistical significance of previous specifications. Only geographical distance loses statistical significance in relation to the first specification. Therefore, the results conclude for the importance of destination country size, information costs (namely, bilateral trade, destination country transparency and common currency), as well as the development, return and correlation of destination country bond market, in the explanation of international bond investment of institutional investors.

4.3.2 The determinants of international bond investment: noninstitutional investors

The determinants of international bond investment of noninstitutional investors are presented in table 4.5.

The first empirical specification considers the traditional gravitational variables (i.e., the size of origin and destination countries and the distance between them) and explains approximately 28% of the variability of international bond investment of noninstitutional investors. The results show that international bond investment of noninstitutional investors is significantly determined by the size of destination country, as well as by the distance between origin and destination countries. In particular, the results denote the preference of noninstitutional investors towards bonds from more developed and nearby countries, which is consistent with the results of previous empirical studies (e.g. Coeurdacier and Martin 2007, Ferreira and Miguel 2011, Daude and Fratzner 2008, Aggarwal, Kearney and Lucey 2012).

Table 4.5: Determinants of international bond investment of noninstitutional investors

This table presents the determinants of international bond investment of noninstitutional investors in the period 2001-2009. International bond investment is measured by the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). Independent variables are shown in the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). For each independent variable, the regression coefficient, t-statistics and the respective statistical significance are displayed. The estimation is based on a OLS regression with cluster-robust standard errors, at the level of each origin country *i*. The last six lines present: the number of observations (N); F-statistics and the statistical significance for the model; the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); the Root Mean Squared Error (RMSE); and the Variance Inflation Factor (VIF). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)		(4)	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-24,103	-5,29***	-17,644	-4,26***	-33,064	-9,47***	-27,237	-7,47***
GDP	*it*	0,194	1,40	0,177	1,43	0,218	1,56	0,212	1,69
GDP	*jt*	0,892	13,36***	0,379	3,05***	0,922	13,03***	0,500	3,42***
Distance	*ij*	-0,734	-6,30***	-0,105	-0,64	-0,678	-5,63***	-0,183	-0,98
Trade	*ijt*			0,689	5,83***			0,695	5,48***
Transparency	*jt*			0,370	10,57***			0,387	8,64***
Contiguity	*ij*			0,009	0,03			0,183	0,56
Language	*ij*			-0,567	-1,38			-0,290	-0,81
Currency	*ij*			0,625	2,28**			0,592	2,28**
Capitalisation	*jt*					1,246	12,51***	0,925	8,80***
Return	*jt*					0,203	2,78**	0,328	4,99***
Correlation	*ijt*					0,506	1,46	-0,180	-0,70
N		2525		2525		2336		2336	
F		99,40***		86,77***		100,76***		152,82***	
R^2		0,279		0,418		0,396		0,503	
R_a^2		0,278		0,417		0,395		0,501	
RMSE		2,068		1,859		1,897		1,723	
Mean VIF		1,08		2,28		1,25		2,23	

The additional information costs variables (i.e., bilateral trade, transparency, contiguity, common language and common currency) are introduced in the second empirical specification. These variables contribute to increase the percentage of international bond investment variability explained by the model from 28% to 42%. The results suggest that noninstitutional investors assign significant higher portfolio weights to bonds from trade partners. This result supports the argument that bilateral trade contributes to increase the flow of information between countries, thereby enhancing international bond investment. Also, it corroborates the results of De Santis and Gérard (2006) and Coeurdacier and Martin (2007). As before, the introduction of bilateral trade reduces the size of the coefficients of destination country size and of geographical distance[49], but only the latter loses its statistical significance. Noninstitutional investors also assign significant higher portfolio weights to bonds

[49] As previously noted, this is probably due to the correlation between these variables. Yet, the mean VIF is within acceptable values.

from more transparent countries, which is consistent with information costs being lower in more transparent countries and with the results found by Coeurdacier and Martin (2007) and Daude and Fratzner (2008). Moreover, noninstitutional investors exhibit a preference towards bonds from countries that share the same currency (euro), thereby supporting the results of Coeurdacier and Martin (2007) and De Santis and Gérard (2006). In fact, from the three dummies considered only common currency is statistically significant, exerting a positive influence on international bond investment of noninstitutional investors.

In turn, the financial variables (i.e., the development, return and risk diversification potential of the destination country bond market) are introduced in the third empirical specification. As a consequence, the percentage of international bond investment variability is increased from 28% to 40%.

The results show that international bond investment of noninstitutional investors is positively and significantly affected by the development of destination country bond market and destination country bond yields. Hence, noninstitutional investors exhibit a preference towards more developed bond markets, as well as towards bonds with higher past returns[50]. International bond investment of noninstitutional investors also tends to be positively affected by the correlation between origin and destination countries bond yields, although this effect is not statistically significant.

The fourth empirical specification, which considers all variables, explains 50% of noninstitutional investors' international bond investment variability. The coefficients of independent variables tend to maintain the sign and the statistical significance of previous specifications. Only geographical distance loses statistical significance in relation to the first specification. Therefore, the results suggest the importance of destination country size, information costs (namely bilateral trade, destination country transparency and common currency), as well as the development and return of destination country bond market, in the explanation of international bond investment of noninstitutional investors.

4.3.3 The determinants of international bond investment: differences between institutional and noninstitutional investors

Table 4.6 presents the differences in the determinants of international bond investment between institutional and noninstitutional investors.

[50] Coeurdacier and Martin (2007) and Aggarwal, Kearney and Lucey (2012) also emphasise the important role of bond market development in attracting international bond investment. De Santis and Gérard (2006) and Ferreira and Miguel (2011) also document the return chasing behaviour of investors.

Table 4.6: Determinants of international bond investment: differences between institutional and noninstitutional investors

This table presents the differences in the determinants of international bond investment between institutional and noninstitutional investors in the period 2001-2009. International bond investment is measured by the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*, that considers: the independent variables; a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors; differential independent variables, that equal the product of each independent variable by the dummy variable d. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within each empirical specification, (1) to (4), the first and second columns display the regression coefficient of each independent variable for noninstitutional investors and t-statistics, respectively, while the third and fourth columns display the regression coefficient of each differential independent variable (i.e. the difference between institutional and noninstitutional investors) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)				(2)				(3)				(4)			
		Noninstitutional		Institutional *vs* Noninstitutional		Noninstitutional		Institutional *vs* Noninstitutional		Noninstitutional		Institutional *vs* Noninstitutional		Noninstitutional		Institutional *vs* Noninstitutional	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-24,103	-5,31***	7,171	2,13**	-17,644	-4,27***	7,879	2,14**	-33,064	-9,51***	7,078	2,06*	-27,237	-7,51***	11,247	3,03***
GDP	*it*	0,194	1,40	-0,254	-2,78**	0,177	1,43	-0,253	-3,13***	0,218	1,57	-0,218	-2,46**	0,212	1,69	-0,253	-3,00***
GDP	*jt*	0,892	13,40***	-0,008	-0,10	0,379	3,06***	0,007	0,06	0,922	13,08***	-0,057	-0,71	0,500	3,43***	-0,125	-1,05
Distance	*ij*	-0,734	-6,32***	0,041	0,47	-0,105	-0,64	0,005	0,04	-0,678	-5,65***	0,122	1,31	-0,183	-0,99	0,165	1,21
Trade	*ijt*					0,689	5,85***	-0,072	-0,64					0,695	5,50***	-0,053	-0,54
Transparency	*jt*					0,370	10,60***	-0,128	-4,31***					0,387	8,67***	-0,284	-10,02***
Contiguity	*ij*					0,009	0,03	-0,127	-0,54					0,183	0,56	0,004	0,02
Language	*ij*					-0,567	-1,38	0,226	0,56					-0,290	-0,82	0,083	0,24
Currency	*ij*					0,625	2,29**	0,520	3,03***					0,592	2,29**	0,201	1,18
Capitalisation	*jt*									1,246	12,56***	-0,031	-0,36	0,925	8,84***	0,130	1,36
Return	*jt*									0,203	2,79**	-0,042	-0,89	0,328	5,01***	-0,136	-2,94***
Correlation	*ijt*									0,506	1,47	0,379	1,81*	-0,180	-0,70	0,499	2,73**
N		8441				8441				8033				8033			
R^2		0,338				0,474				0,482				0,561			
R_a^2		0,338				0,473				0,481				0,560			
RMSE		1,873				1,671				1,642				1,512			

The results of the first empirical specification suggest that the effect of origin country size on international bond investment significantly differs between institutional and noninstitutional investors. In fact, origin country size has a negative (positive) effect on international bond investment of institutional (noninstitutional) investors. This indicates that institutional investors from more developed countries tend to assign significant lower weights to each destination country bonds relative to noninstitutional investors. In turn, the positive effect of destination country size on international bond investment does not significantly differ between both types of investors. Similarly, the negative effect of geographical distance on international bond investment does not significantly differ between institutional investors and noninstitutional investors, although it tends to be slightly stronger for the latter than for the former.

The results of the second empirical specification, which includes the additional information costs variables, show that the positive effects of destination country transparency and common currency on international bond investment significantly differ between institutional and noninstitutional investors. In particular, the preference for bonds of more transparent countries is more pronounced in noninstitutional than in institutional investors, whereas the preference for bonds of countries that share the same currency (euro) is more pronounced in institutional than in noninstitutional investors. The effects of the other additional information costs variables on international bond investment do not seem to significantly differ between institutional and noninstitutional investors. Thus, the results do not allow to either support or reject the information costs theory.

Regarding the third empirical specification, which considers the financial variables, the results indicate that the positive effect of the correlation between origin and destination countries bond yields on international bond investment is significantly stronger for institutional investors than for noninstitutional investors. The effects of destination country bond market development and return do not seem to significantly differ between institutional and noninstitutional investors.

In the fourth empirical specification the differences in the determinants of international bond investment between institutional and noninstitutional investors tend to remain, although there are some changes in their statistical significance. The difference at the level of common currency loses its statistical significance. On the contrary, the difference at the level of destination country bond yields, which in the previous specification was not statistically significant, is now statistically significant. Particularly, the importance of destination country bond yields on international bond investment is significantly higher for noninstitutional than

for institutional investors. Overall, in the final specification, the effects of origin country size, destination country transparency and destination country bond yields on international bond investment are significantly stronger for noninstitutional than for institutional investors. On the contrary, the positive effect of the correlation between origin and destination countries bond yields on international bond investment is significantly stronger for institutional than for noninstitutional investors.

Thus, the results do not allow to support the argument that information costs and familiarity are relatively more important for international bond investment of noninstitutional investors. Moreover, the results are contrary to the argument that financial variables, namely return and risk diversification, are relatively more important for international bond investment of institutional investors.

4.4 Robustness to the consideration of business cycles

This section tests the robustness of results to the consideration different business cycles. For this purpose, the chronology of the euro area business cycles of the Centre for Economic Policy Research (CEPR) is used[51]. Within the time period under analysis (2001-2009), the CEPR identifies one business cycle of recession, with peak in the first quarter of 2008 and trough in the second quarter of 2009. Thus, the period 2001-2009 comprises one business cycle of expansion, from 2001 to 2007, and one business cycle of recession, from 2008 to 2009. For the sake of simplicity, only the results of the fourth empirical specification, which contains all independent variables, are shown.

4.4.1 Expansion cycles

Table 4.7 presents the determinants of international bond investment in business cycles of expansion (2001-2007).

Model (1) focuses on institutional investors. The results show that institutional investors assign significant higher weights to bonds from more developed countries in business cycles of expansion, as denoted by the positive and significant influence of destination country size on international bond investment.

[51] Available at http://www.cepr.org/data/dating/.

Table 4.7: Determinants of international bond investment in business cycles of expansion

This table presents: in model (1), the determinants of international bond investment of institutional investors in business cycles of expansion; in model (2), the determinants of international bond investment of noninstitutional investors in business cycles of expansion; in model (3), the differences in the determinants of international bond investment between institutional and noninstitutional investors in business cycles of expansion. International bond investment is measured by the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Institutional		Noninstitutional		Institutional vs Noninstitutional	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-14,051	-6,09***	-27,117	-7,62***	13,066	3,31***
GDP	*it*	-0,071	-0,88	0,196	1,67	-0,267	-3,30***
GDP	*jt*	0,329	5,15***	0,514	3,40***	-0,185	-1,4
Distance	*ij*	-0,001	-0,01	-0,166	-0,86	0,165	1,18
Trade	*ijt*	0,668	7,63***	0,669	4,95***	-0,001	-0,01
Transparency	*jt*	0,113	2,67**	0,404	8,24***	-0,291	-10,17***
Contiguity	*ij*	0,150	0,72	0,138	0,39	0,012	0,04
Language	*ij*	-0,235	-0,60	-0,377	-1,13	0,141	0,41
Currency	*ij*	0,856	4,66***	0,809	3,21***	0,047	0,21
Capitalisation	*jt*	1,079	15,23***	0,899	8,00***	0,179	1,73
Return	*jt*	0,181	4,40***	0,314	5,10***	-0,133	-2,83**
Correlation	*ijt*	0,164	0,81	-0,292	-0,91	0,456	2,11*
N		4259		1728		5987	
R^2		0,601		0,513		0,573	
R_a^2		0,600		0,510		0,572	
RMSE		1,386		1,698		1,482	

Within the information costs variables, the results show that bilateral trade, destination country transparency and common currency exert a positive and significant effect on international bond investment. Thus, in business cycles of expansion, institutional investors exhibit a preference towards bonds from trade partners, from more transparent countries and from countries with the same currency. Geographical distance, contiguity and common language are not statistically significant.

In relation to financial variables, the results support the preference for more developed bond markets, as well as the return chasing behaviour of institutional investors. In fact, both the development of destination country bond market and destination country bond yields have a positive and significant effect on international bond investment of institutional

investors. The correlation between origin and destination country bond yields tends to exert a positive, although not statistically significant, influence on international bond investment.

Thus, the determinants of international bond investment of institutional investors, in business cycles of expansion are: destination country size; information costs, namely bilateral trade, destination country transparency and common currency; the development and return of destination country bond market. The results in business cycles of expansion mirror those obtained in the global period (2001-2009).

In turn, model (2) considers noninstitutional investors. The results show that, like institutional investors, noninstitutional investors assign significant higher weights to bonds from more developed countries in business cycles of expansion. The results concerning the information costs variables are similar to those found for institutional investors. In fact, only bilateral trade, destination country transparency and common currency are statistically significant, exerting a positive effect on international bond investment of noninstitutional investors in business cycles of expansion. For the financial variables, the results indicate the preference of noninstitutional investors towards bonds from countries with more developed bond markets and with higher past returns. In fact, international bond investment of noninstitutional investors is, in business cycles of expansion, positively and significantly affected by destination country bond market development and destination country bond yields. The correlation between origin and destination country bond yields tends to have a negative influence on international bond investment of noninstitutional investors, which is consistent with the motivation for risk diversification. Yet, this effect is not statistically significant.

Thus, the results obtained in business cycles of expansion mirror those obtained for the global period (2001-2009) and underline, once more, the importance of destination country size, information costs (namely bilateral trade, destination country transparency and common currency) and the development and return of destination country bond market in the explanation of international bond investment of noninstitutional investors.

The differences in the determinants of international bond investment between institutional and noninstitutional investors in business cycles of expansion are presented in model (3). The results suggest that the effect of origin country size on international bond investment is significantly different between institutional and noninstitutional investors. In fact, origin country size has a negative (positive) influence on international bond investment of institutional (noninstitutional) investors. In turn, destination country size tends to affects similarly the international bond investment of institutional and noninstitutional investors.

Within the information costs variables, only the positive effect of destination country transparency on international bond investment significantly differs between institutional and noninstitutional investors. In particular, the preference for bonds from more transparent countries is more pronounced in noninstitutional than in institutional investors. The effects of the remaining information costs variables on international bond investment do not seem to significantly differ between institutional and noninstitutional investors.

The results concerning financial variables indicate that the return chasing behaviour is more pronounced in noninstitutional than in institutional investors. In fact, the positive coefficient of destination country bond yields is significantly higher for noninstitutional than for institutional investors. Also, the correlation between origin and destination countries bond yields affects differently international bond investment of institutional and noninstitutional investors and the difference is statistically significant. As previously noted, the bond return correlation has a positive (negative) effect on international bond investment of institutional (noninstitutional) investors. Thus, it seems that, in business cycles of expansion, noninstitutional investors are more concerned with risk diversification than institutional investors. The positive influence of the development of the destination country bond market does not significantly differ between institutional and noninstitutional investors, although it tends to be slightly stronger for the former than for the latter.

Overall, the effects of destination country size and transparency, as well as the effects of destination country bond return and risk diversification potential, on international bond investment are significantly stronger for noninstitutional than for institutional investors. Thus, with the exception of the correlation between origin and destination countries bond yields, the results for business cycles of expansion are similar to those found for the global period (2001-2009).

4.4.2 Recession cycles

Table 4.8 presents the determinants of international bond investment in business cycles of recession (2008-2009).

The determinants of international bond investment of institutional investors in business cycles of recession are shown in model (1). The results suggest that institutional investors assign significant higher portfolio weights to bonds from more developed countries in business cycles of recession.

Table 4.8: Determinants of international bond investment in business cycles of recession

This table presents: in model (1), the determinants of international bond investment of institutional investors in business cycles of recession; in model (2), the determinants of international bond investment of noninstitutional investors in business cycles of recession; in model (3), the differences in the determinants of international bond investment between institutional and noninstitutional investors in business cycles of recession. International bond investment is measured by the weight of destination country *j* in the international bond portfolio of investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for institutional investors and zero for noninstitutional investors) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Institutional		Noninstitutional		Institutional vs Noninstitutional	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-27,300	-6,40***	-32,876	-4,73***	5,575	0,98
GDP	*it*	0,104	1,01	0,319	1,64	-0,215	-1,51
GDP	*jt*	0,685	5,55***	0,652	3,16***	0,034	0,21
Distance	*ij*	-0,192	-1,07	-0,422	-1,89*	0,230	1,31
Trade	*ijt*	0,402	3,29***	0,576	3,69***	-0,174	-1,5
Transparency	*jt*	0,045	0,69	0,322	6,49***	-0,277	-4,34***
Contiguity	*ij*	0,375	1,28	0,286	0,76	0,088	0,33
Language	*ij*	-0,046	-0,10	0,132	0,25	-0,178	-0,39
Currency	*ij*	0,541	2,40**	-0,031	-0,06	0,572	1,68
Capitalisation	*jt*	1,073	11,41***	1,055	7,26***	0,018	0,12
Return	*jt*	0,249	4,91***	0,369	3,31***	-0,121	-1,22
Correlation	*ijt*	0,800	3,58***	-0,002	-0,01	0,802	2,21**
N		1438		608		2046	
R^2		0,575		0,499		0,551	
R_a^2		0,572		0,490		0,546	
RMSE		1,475		1,765		1,566	

In relation to the information costs variables, only bilateral trade and common currency significantly drive international bond investment of institutional investors in business cycles of recession. In particular, institutional investors exhibit a preference towards bonds of trade partners and towards bonds of countries that share the same currency. Geographical distance, destination country transparency, contiguity and common language do not seem to significantly affect international bond investment of institutional investors in business cycles of recession.

Financial variables, namely destination country bond market development, destination country bond yields and origin and destination countries bond yields correlation, have all a positive and significant effect on international bond investment of institutional investors. Thus,

in business cycles of recession, institutional investors prefer to hold more bonds from countries with more developed bond markets, with higher yields and which are more correlated with origin country bond yields.

Overall, the results show that international bond investment of institutional investors in business cycles of recession are significantly determined by destination country size, information costs (namely bilateral trade and common currency), as well as the development, return and correlation of destination country bond market. In relation to the results for the global period (2001-2009), destination country transparency loses statistical significance in business cycles of recession[52].

In turn, the determinants of international bond investment of noninstitutional investors in business cycles of recession are presented in model (2). The results reinforce the importance of destination country size and information costs in the determination of international bond investment in business cycles of recession. Specifically, the results point out the preference of noninstitutional investors towards bonds of more developed countries, as well as towards bonds from geographically nearby countries, more transparent countries and trade partners. Contiguity, common language and common currency do not seem to matter in business cycles of recession.

The results concerning financial variables suggest that, in business cycles of recession, noninstitutional investors prefer to hold more bonds from countries with more developed bond markets and with higher yields in their portfolios. The correlation between origin and destination country bond yields tends to have a negative effect on international bond investment of noninstitutional investors in business cycles of recession, consistent with the motivation for risk diversification. Yet, this effect is not statistically.

Thus, according to this model, the determinants of international bond investment of noninstitutional investors in business cycles of recession are: destination country size; information costs, namely geographical distance, bilateral trade and destination country transparency; the development and return of destination country bond market. In relation to the results obtained for the global period (2001-2009), geographical distance gains statistical significance, whereas common currency loses statistical significance, in business cycles of

[52] Appendix 4.1 compares the determinants of international bond investment of institutional investors in business cycles of recession and expansion, as well as presents the respective differences. The results suggest that the size of origin and destination countries, the geographical distance between them and the correlation between their bond yields are relatively more important in business cycles of recession. On the contrary, bilateral trade and common currency are relatively more important in business cycles of expansion.

recession[53]. For all other variables, the results obtained for business cycles of recession mirror those obtained for the global period.

The differences in the determinants of international bond investment between institutional and noninstitutional investors are scarcer in business cycles of recession. In fact, the results of model (3) show that only the effects of destination country transparency and of the correlation between origin and destination countries bond yields on international bond investment significantly differ between institutional and noninstitutional investors. In particular, the preference for bonds from more transparent countries is more pronounced in noninstitutional than in institutional investors. In contrast, the preference for foreign bonds whose yields are more correlated with domestic ones is more pronounced in institutional than in noninstitutional investors[54].

4.5 Conclusion

The objectives of this chapter were threefold. First, to analyse the determinants of international bond investment of institutional investors. Second, to analyse the determinants of international bond investment of noninstitutional investors. Third, to compare the determinants of international bond investment between institutional and noninstitutional investors. For this purpose, a gravity-model was applied to the international bond investment of institutional and noninstitutional investors from 20 countries from OECD, during the period 2001-2009. Additionally, the robustness of results to the consideration of different business cycles was also tested.

The results suggest the importance of destination country size and information costs in the determination of international bond investment of both institutional and noninstitutional investors, thereby corroborating the results of previous empirical studies (e.g. Ferreira and Miguel 2011). The results also emphasise the importance of the development and return of destination country bond market in the determination of international bond investment of both institutional and noninstitutional investors.

[53] Also, in relation to business cycles of expansion, geographical distance (common currency) gains (loses) statistical significance in business cycles of recession. This suggests that the relative importance of geographical distance is superior in business cycles of recession, while the relative importance of common currency is superior in business cycles of expansion. However, the analysis of the differences in the determinants of international bond investment of noninstitutional investors between business cycles, presented in Appendix 4.2, only supports the latter effect.

[54] Note that, in business cycles of recession, the correlation between origin and destination bond yields has a positive (negative) influence on international bond investment of institutional (noninstitutional) investors.

Furthermore, the results indicate that there are few significant differences in the determinants of international bond investment between institutional and noninstitutional investors. In fact, within information costs variables, only the effect of destination country transparency on international bond investment significantly differs between institutional and noninstitutional investors. Specifically, the preference for bonds of more transparent countries is more pronounced in noninstitutional than in institutional investors. The influence of other information costs variables on international bond investment do not significantly differ between institutional and noninstitutional investors. Regarding financial variables, the return chasing behaviour is significantly more pronounced in noninstitutional than in institutional investors. On the contrary, the preference for foreign bonds whose yields are more correlated with domestic bond yields is more pronounced in institutional than in noninstitutional investors.

Hence, the results for international bond investment are surprising for two main reasons: first, they do not allow to either support or reject the argument that information costs and familiarity are more important for noninstitutional than for institutional investors; second, they are contrary to the idea that financial variables, namely return and risk diversification, are more important for institutional than for noninstitutional investor. Overall, the results remain robust to the consideration of business cycles of expansion. In business cycles of recession, only the differences at the level of destination country transparency and the correlation between origin and destination countries bond yields remain statistically significant.

The empirical analysis carried out in this chapter offers important contributions to the literature. First, this is the primary investigation on the determinants of international bond investment considering simultaneously institutional and noninstitutional investors. By distinguishing these two types of investors, the analysis is purged from the hypothesis of homogeneity of preferences between institutional and noninstitutional investors, which underlies studies that use aggregated data for all investors within each investment origin country. Moreover, and more importantly, this allows to compare the determinants of international bond investment between institutional and noninstitutional investors. This issue has not been addressed by previous studies, as they either consider all investors aggregately (e.g. Ferreira and Miguel 2011) or just one type of investor, such households (e.g. Kyrychenko and Shum 2006). The results suggest that there are few significant differences in the determinants of international bond investment between institutional and noninstitutional investors. As such, the disaggregation of data by type of investor in the analysis of the

determinants of international bond investment does not seem as imperative as in the case of international equity investment, although still convenient.

Second, the influence of business cycles in the determinants of international bond investment is also taken into account. Previous studies have not dealt with this issue since they only consider one year (e.g. Coeurdacier and Martin 2007), two years (e.g. De Santis and Gérard 2006), or three or more discontinuous years of investment analysis (e.g. Ferreira and Miguel 2011). In fact, based on a continuous 9 year period of data, the results suggest that the determinants of international bond investment are influenced by business cycles. These findings thus suggest that neglecting the disaggregation of data by business cycles might lead to incomplete conclusions on the determinants of international bond investment.

Appendices

Appendix 4.1
Determinants of international bond investment of institutional investors by business cycles

This table presents: in model (1), the determinants of international bond investment of institutional investors in business cycles of expansion; in model (2), the determinants of international bond investment of institutional investors in business cycles of recession; model (3), the differences in the determinants of international bond investment of institutional investors between business cycles of recession and business cycles of expansion. International bond investment is measured by the weight of destination country *j* in the international bond portfolio held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown is the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for business cycles of recession and zero for business cycles of expansion) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the *Root Mean Squared Error* (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)	
		Expansion		Recession		Recession vs Expansion	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-14,051	-6,09***	-27,300	-6,40***	-13,249	-3,69***
GDP	*it*	-0,071	-0,88	0,104	1,01	0,175	2,80**
GDP	*jt*	0,329	5,15***	0,685	5,55***	0,356	3,88***
Distance	*ij*	-0,001	-0,01	-0,192	-1,07	-0,191	-2,02*
Trade	*ijt*	0,668	7,63***	0,402	3,29***	-0,266	-3,63***
Transparency	*jt*	0,113	2,67**	0,045	0,69	-0,068	-1,24
Contiguity	*ij*	0,150	0,72	0,375	1,28	0,224	1,08
Language	*ij*	-0,235	-0,60	-0,046	-0,10	0,189	0,92
Currency	*ij*	0,856	4,66***	0,541	2,40**	-0,315	-3,05***
Capitalisation	*jt*	1,079	15,23***	1,073	11,41***	-0,006	-0,08
Return	*jt*	0,181	4,40***	0,249	4,91***	0,068	1,66
Correlation	*ijt*	0,164	0,81	0,800	3,58***	0,636	2,39**
N		4259		1438		5697	
R^2		0,601		0,575		0,594	
R_a^2		0,600		0,572		0,593	
RMSE		1,386		1,475		1,409	

Appendix 4.2
Determinants of international bond investment of noninstitutional investors by business cycles

This table presents: in model (1), the determinants of international bond investment of noninstitutional investors in business cycles of expansion; in model (2), the determinants of international bond investment of noninstitutional investors in business cycles of recession; model (3), the differences in the determinants of international bond investment of noninstitutional investors between business cycles of recession and business cycles of expansion. International bond investment is measured by the weight of destination country *j* in the international bond portfolio held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown is the first column. A detailed description of independent variables is provided in table 4.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for business cycles of recession and zero for business cycles of expansion) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the *Root Mean Squared Error* (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Expansion		Recession		Recession vs Expansion	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-27,117	-7,62***	-32,876	-4,73***	-5,759	-1,08
GDP	*it*	0,196	1,67	0,319	1,64	0,123	1,04
GDP	*jt*	0,514	3,40***	0,652	3,16***	0,138	0,90
Distance	*ij*	-0,166	-0,86	-0,422	-1,89*	-0,256	-1,65
Trade	*ijt*	0,669	4,95***	0,576	3,69***	-0,094	-0,72
Transparency	*jt*	0,404	8,24***	0,322	6,49***	-0,082	-1,62
Contiguity	*ij*	0,138	0,39	0,286	0,76	0,148	0,51
Language	*ij*	-0,377	-1,13	0,132	0,25	0,509	1,49
Currency	*ij*	0,809	3,21***	-0,031	-0,06	-0,840	-1,90*
Capitalisation	*jt*	0,899	8,00***	1,055	7,26***	0,156	1,02
Return	*jt*	0,314	5,10***	0,369	3,31***	0,056	0,66
Correlation	*ijt*	-0,292	-0,91	-0,002	-0,01	0,290	0,70
N		1728		608		2336	
R^2		0,513		0,499		0,51	
R_a^2		0,510		0,490		0,505	
RMSE		1,698		1,765		1,715	

Chapter 5: The determinants of international equity and bond investment: analysing the differences between assets

5.1 Introduction

This chapter analyses and compares the determinants of international equity and bond investment. In particular, the analysis focuses on the relative importance of information costs on international equity and bond investment. As underlined by Gehrig (1993), "the informational requirements for valuing equities are much larger than for valuing bonds" (Gehrig, 1993, pp. 101) and therefore international equity investment should be more sensitive to information costs than international bond investment. Portes, Rey and Oh (2001) emphasise that different types of financial assets require different intensity of information: equities are much more information intensive than bonds, especially government bonds, and therefore information costs variables should not be as significant, if at all, for international bond investment as for international equity investment.

In this context, it is reasonable to expect that information costs are more important for international equity investment relative to international bond investment. However, empirical evidence on this issue is scarce and inconclusive. In fact, the majority of empirical studies have focused on the determinants of international equity investment and, to a lesser extent, on the determinants of international bond investment, without providing a comparison of those determinants by type of asset. The studies of Portes, Rey and Oh (2001), De Santis and Gérard (2006), Coeurdacier and Martin (2007), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012) analyse the determinants of both international equity and bond investment and therefore set the conditions for a comparison of those determinants between assets. However, the empirical evidence is inconclusive on the relative importance of information costs for international equity and bond investment. For instance, while the effect of bilateral trade and common language are usually found to be stronger for equities than for bonds, the effect of geographical distance is usually found to be stronger for bonds than for equities; and while Daude and Fratzscher (2008) conclude that destination country transparency is more important for equity than for bond investment, De Santis and Gérard (2006) and Coeurdacier and Martin (2007) find the opposite result. Thus, evidence remains basically inconclusive. Moreover, these studies are limited since they only compare the regression coefficients found for equities with those found for bonds, without assessing the statistical significance of the differences found. The exception is Daude and Fratzscher (2008).

The objectives of this chapter are threefold. First, to investigate the determinants of international equity investment. Second, to investigate the determinants of international bond investment. Third, to investigate the differences in the determinants of international equity and bond investment. For this purpose, a gravity-model is applied to the international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries, at the end of years 2001 to 2009. Additionally, the robustness of results to the consideration of different business cycles (expansion and recession), as well as to the consideration of different types of investors (institutional and noninstitutional investors) is also verified.

This chapter offers important contributions to the literature. First, by considering simultaneously international equity and bond investment, it analyses the differences on the determinants of international investment between assets with different informational requirements and, above all, it provides a statistical significance for those differences. As already mentioned, with the exception of Daude and Fratzscher (2008), previous empirical studies have not assessed the statistical significance of the differences in the determinants of international equity and bond investment. Second, by using a continuous 9 year period of data, the influence of business cycles in the determinants of both international equity and bond investment is also taken into account. This issue has not been addressed by previous studies, since they only consider one year (e.g. Coeurdacier and Martin 2007), two years (e.g. De Santis and Gérard 2006), or three or more discontinuous years of investment analysis (e.g. Daude and Fratzner 2008). Third, by using data disaggregated by type of investor, the influence of investors' characteristics in the determinants of both international equity and bond investment is also taken into account. This has not been addressed by previous studies, since they tend to consider aggregated data for all investors within each origin country (e.g. De Santis and Gérard 2006, Coeurdacier and Martin 2007, Daude and Fratzscher 2008, Aggarwal, Kearney and Lucey 2012).

This chapter is organised as follows. Section 2 presents the research design, namely the sample, variables and estimation procedures. Section 3 presents and discusses the empirical results. Section 4 analyses the robustness of empirical findings to the consideration on different business cycles, as well as to the consideration of different types of investors. Finally, section 5 concludes.

5.2 Research design

5.2.1 Sample

The empirical analysis is based on international portfolio investment holdings data, collected by the Coordinated Portfolio Investment Survey (CPIS), under the auspices of the International Monetary Fund (IMF). The CPIS data can be disaggregated by: type of asset; sector of the asset holder; country of residence of the asset holder; country of residence of the asset issuer; and year of investment.

According to the type of asset, the CPIS breaks down international portfolio investment holdings by equity securities, long-term debt securities and short-term debt securities. Given the objective of this study, only holdings on equity securities and long-term debt securities (hereafter, bonds) are considered.

According to the sector of the asset holder (hereafter, type of investor), the CPIS breaks down international portfolio investment holdings by monetary authorities, banks, other financial institutions (including insurance, mutual funds and others), government, and nonfinancial sector (including nonfinancial companies, households and others). In this study, only holdings of banks and other financial institutions (institutional investors) and holdings of nonfinancial sector (noninstitutional investors) are considered. Monetary authorities and government are thus excluded from the sample.

As for the country of residence of the asset holder (hereafter, investment origin country) and country of residence of the asset issuer (hereafter, investment destination country), the CPIS considers several countries. However, taking into account the availability of data on other variables, only OECD countries are considered. Among these, Luxembourg[55], as well as countries that become members of OECD in 2010 (Chile, Estonia, Israel and Slovenia)[56] are excluded. International equity and bond investment holdings by sector of the holder are not available for Belgium, Canada, Iceland, Ireland, Korea, Poland, Slovak Republic, Switzerland and United States and, as such, these countries are also excluded from the sample of investment origin countries.

[55] Lane and Milesi-Ferretti (2008) also excluded off-shore financial centres, such as Luxembourg. They argue that off-shore financial centres "act as pure intermediaries and are neither true sources nor final destinations of investment" Milesi-Ferretti (2008, pp. 543).

[56] These countries were excluded since they were not members of OECD in the time period under analysis (2001-2009).

Therefore, the sample of investment origin countries comprises 20 OECD countries, namely Australia, Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey and United Kingdom. In turn, the sample of investment destination countries comprises 29 OECD countries, namely Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

Concerning the years of investments, data on international portfolio investment holdings are available, on a yearly basis, for 1997 and from 2001 onwards. In this study, a continuous 9 year period is considered, namely from 2001 to 2009[57].

5.2.2 Variables

The dependent and independent variables are selected and defined on the basis of the existing theoretical and empirical literature on international portfolio investment, reviewed in the second chapter.

The dependent variable is the weight of destination country *j* in the total value of asset *a* (equities or bonds) held by investor *k* of origin country *i* at the end of year *t*, calculated as in equation 5.1:

$$w_{kiajt} = \frac{H_{kiajt}}{\sum_{j=1}^{29} H_{kiajt}} . 100 \qquad \textbf{(5.1)}$$

where w_{kiajt} is the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* at the end of year *t*; H_{kiajt} is the value held by investor *k* of origin country *i* in asset *a* of destination country *j* at the end of year *t*. Data is from CPIS IMF. In the computation of the dependent variable, international holdings reported as unavailable, confidential, zero value or negative value (short-selling) were excluded.

Following the theoretical framework developed by Martin and Rey (2004) for the application of gravity-models in the analysis of international portfolio investment, three groups of independent variables are considered: (1) size variables; (2) information costs variables; (3) financial variables.

[57] At the time of the last data collection, 2009 was the last year of available CPIS data.

The first group of variables includes the size of origin and destination countries, as measured by GDP. More precisely, it considers the GDP of origin country *i* in year *t* and the GDP of destination country *j* in year *t*. Data is obtained from the World Bank. It is expected that both international equity and bond investment are positively affected by the size of origin and destination countries, as in Coeurdacier and Martin (2007)[58].

The second group of variables includes the distance between origin and destination countries, as well as additional information costs variables, such as bilateral trade, transparency, contiguity, common language and common currency.

Distance between origin and destination countries has been traditionally used as a proxy of transaction and information costs. Several empirical studies have shown that international equity and bond investment is negative and significantly affected by distance (e.g. Portes, Rey and Oh 2001, Coeurdacier and Martin 2007, Daude and Fratzner 2008, Aggarwal, Kearney and Lucey 2012). According to Portes, Rey and Oh (2001), the observed negative relationship between distance and international equity and bond investment can be explained by information costs: "countries which are near each other tend to know much more about each other, either because of direct interaction between their citizens for tourism or business, or because of better media coverage, or because they tend to learn each other's languages" (Portes, Rey and Oh, 2001, pp. 784). In this study, distance between origin and destination countries is measured by the geographical distance between the capital city of origin country *i* and the capital city of destination country *j*. Data is collected from Geodesic Distance Database of the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). It is expected that geographical distance negatively affects international equity and bond investment. As a measure of information costs, and to some extent, of the degree of familiarity between origin and destination countries, it is also expected that the negative effect of geographical distance on international investment is stronger for equities than for bonds, as suggested by Portes, Rey and Oh (2001). However, Coeurdacier and Martin (2007), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012) find the opposite result.

Bilateral trade is also considered as an information costs variables. Portes and Rey (2005) suggest that bilateral trade contribute to increase the flow of information between trade partners, thereby reducing information costs associated with international equity investment. Lane and Milessi-Ferretti (2008) show that there is a strong link between bilateral trade and international equity investment and they suggest that this observation is particularly

[58] Coeurdacier and Martin (2007) find that destination country size is a more important determinant of international equity investment than of international bond investment.

consistent with the informational potential of bilateral trade. Aviat and Coeurdacier (2007) find that trading in the goods market reduces informational asymmetries in the financial markets (and vice versa) and, hence, international asset holdings are strongly affected by trade patterns. Diyarbakirlioglu (2011) underlines the importance of bilateral trade in the explanation of international equity investment through its potential as an information variable. Although these studies are mainly focused on international equity investment, a similar conclusion can be taken for international bond investment. In fact, De Santis and Gérard (2006) and Coeurdacier and Martin (2007) find that bilateral trade is an important determinant of international bond investment. In this study, bilateral trade is measured by the weight of destination country *j* on total trade (imports plus exports) of origin country *i* in year *t*. Data is obtained from United Nation's Commodity Trade Statistics (COMTRADE).

The transparency of investment destination country is also included as a proxy for information costs. Diyarbakirlioglu (2011) sustains that more transparency implies less (perceived) risk and/or low information costs, thereby encouraging investors to invest more in more transparent countries. Indeed, De Santis and Gérard (2006), Coeurdacier and Martin (2007) and Daude and Fratzner (2008) find that both international equity and bond investment are positively and significantly determined by transparency. In this study, the transparency of destination country *j* in year *t* is assessed by the Corruption Perception Index (CPI), from Transparency International. The CPI evaluates the perception of corrupt practices in both public and private sectors, scoring countries on a scale from 0 (highly corrupt) to 10 (very clean).

A set of dummies for contiguity, common language and common currency is also included as these variables are commonly used to capture information costs. Contiguity, a dummy that equals one if origin country *i* and destination country *j* are geographically contiguous, is included since it is expected that information flows, and hence, international equity and bond investment is more intense between neighbour countries. Similarly, common language, a dummy that equals one if origin country *i* and destination country *j* share the same official language, is included since it is expected that common language significantly reduces the cost of gathering, interpreting and comparing information, as suggested by Faruquee, Li and Yan (2004). In fact, Coeurdacier and Martin (2007), Daude and Fratzner (2008) and Aggarwal, Kearney and Lucey (2012) find a positive and significant relationship between common language and both international equity and bond investment. Data on contiguity and common language is from the Geodesic Distance database from CEPII.

Common currency, a dummy that equals one if origin country *i* and destination country *j* share the same currency, is also included since it is expected that a common currency will reduce the transaction and information costs, thereby increasing both international equity and bond investment. From the origin and destination countries included in the sample only members of European Monetary Union (EMU) share the same currency – the euro. Coeurdacier and Martin (2007) find that the euro has contributed to decrease transaction costs and, hence, increase international equity and bond investment within euro zone. De Santis and Gérard (2006) also presents evidence that euro area investors assign higher portfolio weights to assets from euro area countries. Common currency is constructed on the basis of the information provided by The World Factbook of Central Intelligence Agency (CIA).

Note that the additional information costs variables (bilateral trade, transparency, contiguity, common language and common currency) reflect lower information costs and greater familiarity between investment origin and destination countries. As such, they should positively affect both international equity and bond investment. For the same reason, this positive effect should be stronger for equity than for bond investment. Nevertheless, the empirical evidence is not consensual, at least for some of these variables. De Santis and Gérard (2006) and Coeurdacier and Martin (2007) find that the effect of bilateral trade on international investment is more important for equities than for bonds. Daude and Fratzscher (2008) find that the effect of destination country transparency is stronger for equities than for bonds, whereas De Santis and Gérard (2006) and Coeurdacier and Martin (2007) find the opposite result. Coeurdacier and Martin (2007), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012) find that the positive effect of common language on international investment is stronger for equities than bonds. De Santis and Gérard (2006) and Coeurdacier and Martin (2007) find that the effect of common currency on international investment is stronger for bonds than equities.

The third group of variables includes financial variables that capture the development, return and risk diversification potential of destination country equity and bond markets.

The development of destination country equity and bond market is included since more developed markets tend to be more structured, more liquid, and with lower transaction costs (Ferreira and Miguel 2007, 2011). In this study, the development of destination country equity market is proxied by the ratio between the equity market capitalisation and the GDP of destination country *j* in year *t*. Data on equity market capitalisation and GDP are from the World Bank. It is expected that destination country equity market development has a positive impact on international equity investment, as shown by Coeurdacier and Martin (2007), Daude

and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012), among others. In turn, the development of destination country bond market is measured by the ratio between the bond market capitalisation and the GDP of destination country *j* in year *t*. Data on bond market capitalisation is from the Bank for International Settlements (BIS) Quarterly Review and is calculated by the sum of market value of domestic and international bonds[59]. Data on GDP is obtained from the World Bank. It is expected that destination country bond market development has a positive and significant impact on international bond investment, as documented by Coeurdacier and Martin (2007) and Aggarwal, Kearney and Lucey (2012).

The return on destination country equity and bond markets is also included to evaluate the return chasing behaviour of investors (e.g. Bohn and Tesar 1996, Froot, O'Connell and Seasholes 2001, Brennan, Cao, Strong and Xu 2005). The return on destination country equity market is proxied by the annualised mean of monthly returns on destination country *j* equity market index over a five years period (including year *t*). Monthly returns were calculated on the basis of monthly prices obtained from Morgan Stanley Capital International (MSCI). According to the return chasing behaviour hypothesis, it is expected that international equity investment is positively affected by destination country equity market return. Several empirical studies have supported this hypothesis (e.g. Faruquee, Li and Yan 2004, De Santis and Gérard 2006, Coeurdacier and Martin 2007, Ferreira and Miguel 2007). Nevertheless, other studies document the contrarian behaviour, i.e., a superior investment in equity markets with lower returns (e.g. Hamao and Mei 2001, Diyarbakirlioglu 2011). In turn, the return on destination country bond market is proxied by the annualised mean of monthly yields on long-term government bonds[60] of destination country *j* over a five years period (including year *t*). Data on monthly returns is from OECD statistics. According to the return chasing behaviour hypothesis, it is expected that international bond investment is positively affected by destination country bond returns. Empirical studies have supported this hypothesis (e.g. De Santis and Gérard 2006, Ferreira and Miguel 2011).

The risk diversification potential of destination country equity market is proxied by the correlation coefficient between the monthly returns of the equity market index of origin country *i* and the equity market index of destination country *j* over a five year period (including year *t*). Return correlation is expected to be negatively related to international equity

[59] The market value of domestic bonds is assessed by the difference between the market value of outstanding domestic debt securities (table 16A from BIS Quarterly Review) and the market value of outstanding short term domestic debt securities (table 17A from BIS Quarterly Review). In turn, the market value of international bonds is assessed by the market value of outstanding international bonds and notes (table 14B from BIS Quarterly Review)

[60] vid. footnote 44 on page 95.

investment, since the higher the return correlation, the lower the risk diversification potential (Solnik 1974a). Although some empirical studies support this negative relationship between return correlation and international equity investment (e.g. Faruquee, Li and Yan 2004), others present evidence of an opposite relationship (e.g. Amadi 2004b, Mishra 2007, Ferreira and Miguel 2007, Lane and Milesi-Ferretti 2008). In turn, the risk diversification potential of destination country bond market is proxied by the correlation coefficient between the monthly yields on long-term government bonds of origin country *i* and the monthly yields on long-term government bonds of destination country *j* over a five year period (including year *t*). Return correlation is expected to be negatively related to international bond investment, since the higher the return correlation, the lower the risk diversification potential (Solnik 1974a). Nevertheless, De Santis and Gérard (2006) and Ferreira and Miguel (2011) find a positive relationship between return correlation and international bond investment.

Table 5.1 summarises the dependent and independent variables used in this study, while tables 5.2 and 5.3 present, respectively, the descriptive statistics and the correlation matrix.

Table 5.1: Determinants of international equity and bond investment: dependent and independent variables

This table presents the dependent and independent variables used to investigate the determinants of international equity and bond investment. The first column presents the category of the dependent or independent variable. The second column presents the variable(s) used within each category. The third column presents the dimension of each variable (i.e., if it varies at the level of each investor *k*, origin country *i*, destination country *j* and/or year of investment *t*). The fourth column presents a description of the variable. The fifth column presents the data source.

Category	Variable	Dim.	Description	Data Source
International Investment	Investment	*kiajt*	Weight of destination country *j* in total value of asset *a* held by investor *k* of origin country *i* in year *t* (natural logarithm)	CPIS IMF
Size	GDP	*it*	Origin country *i* GDP in year *t* (natural logarithm)	World Bank
	GDP	*jt*	Destination country *j* GDP in year *t* (natural logarithm)	World Bank
Information Costs	Distance	*ij*	Geographical distance between the capital city of origin country *i* and destination country *j* (natural logarithm)	CEPII
	Trade	*ijt*	Weight of destination country *j* in total trade (imports plus exports) of origin country *i* in year *t* (natural logarithm)	COMTRADE
	Transparency	*jt*	Corruption Perceptions Index that scores, in year t, destination country *j* on a scale from 0 (highly corrupt) to 10 (very clean), on the basis of perception of corrupt practices in both public and private sectors	Transparency International
	Contiguity	*ij*	Dummy variable that equals one if origin country *i* and destination country *j* are geographically contiguous	CEPII
	Language	*ij*	Dummy variable that equals one if origin country *i* and destination country *j* share the same official language	CEPII
	Currency	*ijt*	Dummy variable that equals one if origin country *i* and destination country *j* share the same currency	CIA World Factbook
Market Development	Capitalisation	*ajt*	Equity: The ratio between equity market capitalisation of destination country *j* in year *t* and destination country *j* GDP in year *t* (natural logarithm)	World Bank
			Bond: The ratio between bond market capitalisation of destination country *j* in year *t* and destination country *j* GDP in year *t* (natural logarithm)	BIS World Bank
Return	Return	*ajt*	Equity: Annualised mean of monthly return of destination country *j* equity market index over a 5 years period (including year *t*)	MSCI
			Bond: Annualised mean of monthly yields on long-term government bonds of destination country *j* over a 5 years period (including year *t*)	OECD
Diversification	Correlation	*aijt*	Equity: Correlation coefficient between the monthly returns on the equity market index of origin country *i* and destination country *j* over a 5 years period (including year *t*)	MSCI
			Bond: Correlation coefficient between the monthly yields on long-term government bonds of origin country *i* and destination country *j* over a 5 years period (including year *t*)	OECD

Table 5.2: Determinants of international equity and bond investment: descriptive statistics

This table presents the descriptive statistics for the dependent and independent variables used to investigate the determinants of international equity and bond investment. The first column presents the variables. The second column presents the dimension of each variable (i.e., if it varies at the level of each investor *k*, origin country *i*, destination country *j* and/or year of investment *t*). The third to seventh columns present the number of observations, the mean, the standard deviation, the minimum and the maximum value of each variable, respectively. For a detailed description of independent variables please see table 5.1.

Variable	Dim.	Obs.	Mean	Std.Dev.	Min.	Max.
Investment	*kijt*	16377	-0,229	2,401	-13,323	4,605
GDP	*it*	16377	27,089	1,137	24,697	29,247
GDP	*jt*	16377	27,065	1,357	22,793	30,291
Distance	*ij*	16377	7,707	1,107	4,088	9,883
Trade	*ijt*	16374	0,345	1,391	-6,705	4,313
Transparency	*jt*	16377	7,227	1,863	3,100	9,900
Capitalisation	*jt*	16377	4,354	0,742	1,637	6,535
Return	*jt*	15972	5,605	7,991	-22,737	40,775
Correlation	*ijt*	15796	0,652	0,277	-0,754	0,999

Table 5.3: Determinants of international equity and bond investment: correlation matrix

This table presents the correlation matrix for the independent variables used to investigate the determinants of international equity and bond investment. The first column presents the variables. The second column presents the dimension of each variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). The remaining columns present the correlation coefficient between each pair of variables. For a detailed description of independent variables please see table 5.1.

Variable	Dim.	GDP	GDP	Distance	Trade	Transp.	Cap.	Return	Corr.
GDP	*it*	1							
GDP	*jt*	-0,066	1						
Distance	*ij*	0,175	0,210	1					
Trade	*ijt*	-0,122	0,592	-0,509	1				
Transparency	*jt*	-0,041	-0,006	0,005	0,059	1			
Capitalisation	*jt*	-0,053	0,197	0,008	0,146	0,456	1		
Return	*jt*	0,027	-0,106	0,019	-0,148	-0,148	0,045	1	
Correlation	*ijt*	-0,001	0,010	-0,352	0,265	0,155	0,064	-0,113	1

As the descriptive statistics table shows, the mean weight of each destination country in investors' international portfolio is -0,229 (corresponding to 5,06% in the variable original values). The average GDP of origin countries included in the sample is 27,089 ($1,09x10^{12}$ US dollars), with Japan (New Zealand) exhibiting the highest (lowest) GDP in the sample period. The average GDP of destination countries included in the sample is 27,065 ($1,48x10^{12}$ US dollars), with USA (Iceland) presenting the highest (lowest) GDP in the sample period.

The geographical distance between the capital cities of origin and destination countries in the sample is, on average, 7,707 (4042 km), with a minimum of 4,088 (60 km) between Vienna and Bratislava and a maximum of 9,883 (19586 km) between Madrid and Wellington. On average, the weight of destination country in total trade of origin country is 0,345 (3,28%), with a minimum of -6,705 (0,0012%), between Mexico and Iceland, and a maximum of 4,313 (74,65%), between México and USA. The average CPI score of destination countries in the sample is 7,227 with Finland (Mexico) presenting the highest (lowest) transparency.

In relation to the development, return and risk diversification potential of the destination country equity and bond market, it is possible to observe that: on average, the destination country market capitalisation scaled by GDP is 4,354 (101%), with Switzerland (Slovakia) being the destination country with the most (less) developed equity market and Iceland (Czech Republic) the destination country with the most (less) developed bond market; the average return on equities and bonds of destination countries included in the sample is 5,605%, with the Czech Republic (Ireland) equity market index presenting the highest (lowest) returns and Mexican (Japanese) bonds presenting the highest (lowest) returns; the average return correlation between origin and destination countries is 0,652, with Germany and France (New Zealand and Finland) exhibiting the highest (lowest) equity return correlation and Germany and France as well as Portugal and Spain (Norway and Mexico) exhibiting the highest (lowest) bond return correlation.

From the correlation matrix, it is possible to see that there is a moderate correlation between bilateral trade and destination country GDP (0,592), as well as between bilateral trade and geographical distance (-0,509). In fact, this was expected since the gravitational model is also used to explain bilateral trade patterns and therefore destination country GDP and geographical distance also emerge as important determinants. Thus, the simultaneous consideration of these variables can create problems of multicolinearity. This potential problem will be considered by reporting mean variance inflation factor (VIF) in individual regressions.

5.2.3 Estimation

To estimate the determinants of international equity and bond investment, separate OLS regressions are run for each type of asset. By running separate regressions for each type of asset, one is able to identify the importance and significance of each independent variable in the determination of both international equity and bond investment.

The estimation procedure is represented by equation 5.2:

$$ln(w_{kiajt}) = \alpha + \beta.X_{iajt} + v_{kiajt} \quad \textbf{(5.2)}$$

Where w_{kiajt} is the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* at the end of year *t* (calculated as in equation 5.1); α is a constant; X_{iajt} is a vector of independent variables (fully described in the previous subsection); and v_{kiajt} are cluster-robust standard errors[61], with $v_{kiajt} = \mu_i + \varepsilon_{kiajt}$.

Within this estimation procedure, four empirical specifications are proposed[62]. The first empirical specification considers the traditional gravitational variables, i.e., the size of both origin and destination countries and the distance between them. The second empirical specification considers, besides the traditional gravitational variables, the additional information costs variables, namely bilateral trade, transparency, contiguity, common language and common currency. The third empirical specification considers, besides the traditional gravitational variables, the financial variables, namely the development, return and risk diversification potential of destination country equity and bond market. Finally, the fourth empirical specification considers all variables simultaneously.

To compare the determinants of international equity and bond investment, a single pooled OLS regression for both types of assets is run. This regression includes: a set of independent variables; a dummy d, that equals one for bonds and zero for equities; differential independent variables, that equal the product of each independent variable by the dummy d.

The estimation procedure is represented by equation 5.3:

$$ln(w_{kiajt}) = \alpha + d + \beta.X_{iajt} + \beta'.X_{iajt}.d + v_{kiajt} \quad \textbf{(5.3)}$$

Where w_{kiajt} is the weight of destination country *j* in the total value of asset a held by investor *k* of origin country *i* at the end of year *t* (calculated as in equation 5.1); α is a constant; d is a dummy that equals one for bonds and zero for equities; X_{iajt} is a vector of independent variables (fully described in the previous subsection); and v_{kiajt} are cluster-robust standard errors, with $v_{kiajt} = \mu_i + \varepsilon_{kiajt}$.

[61] Since investors are clustered within each origin country *i*, the cluster is defined at the level of each origin country *i*.

[62] The four empirical specifications only differ with respect to the independent variables included in the vector X_{ijt} of equation 5.2.

This estimation procedure allows to compare the coefficient of each independent variable between assets, as well as to present the statistical significance of the difference[63], as follows: α and β represent the intercept (constant) and the coefficient of each independent variable for the omitted group, i.e., equity, while d and β' represent the difference in the intercept and in the coefficient of each independent variable between bond and equity.

5.3 Empirical results

5.3.1 The determinants of international equity investment

Table 5.4 presents the determinants of international equity investment.

Table 5.4: Determinants of international equity investment

This table presents the determinants of international equity investment in the period 2001-2009. International equity investment is measured by the weight of destination country *j* in the total value of equities held by investor *k* of origin country *i* in year *t* (natural logarithm). Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). For each independent variable, the regression coefficient, t-statistics and the respective statistical significance are displayed. The estimation is based on a OLS regression with cluster-robust standard errors, at the level of each origin country *i*. The last six lines present: the number of observations (N); F-statistics and the statistical significance for the model; the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); the Root Mean Squared Error (RMSE); and the Variance Inflation Factor (VIF). Statistical Significance: * $p < 0,1$; ** $p < 0,05$; *** $p < 0,01$.

		(1)		(2)		(3)		(4)	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-27,080	-9,06***	-18,167	-7,88***	-26,377	-9,77***	-18,014	-7,13***
GDP	*it*	0,063	0,6	-0,006	-0,07	0,137	1,46	0,044	0,53
GDP	*jt*	1,148	17,69***	0,595	7,05***	0,919	18,63***	0,518	6,07***
Distance	*ij*	-0,789	-7,46***	-0,092	-0,85	-0,843	-8,14***	-0,203	-1,68
Trade	*ijt*			0,712	7,68***			0,612	6,30***
Transparency	*jt*			0,296	9,79***			0,133	5,89***
Contiguity	*ij*			0,425	2,17**			0,525	2,83**
Language	*ij*			0,485	2,55**			0,287	1,37
Currency	*ij*			0,455	2,04*			0,462	2,16**
Capitalisation	*jt*					1,054	8,53***	0,717	7,18***
Return	*jt*					-0,040	-9,91***	-0,025	-6,54***
Correlation	*ijt*					-0,273	-0,9	-0,258	-0,85
N		7936		7933		7763		7760	
F		118,60***		141,22***		77,75***		134,69***	
R^2		0,375		0,493		0,450		0,502	
R_a^2		0,375		0,493		0,449		0,501	
RMSE		1,978		1,780		1,796		1,708	
Mean VIF		1,07		2,09		1,23		2,14	

[63] This procedure is similar to the statistical test proposed by Cohen (1983) for comparing regression coefficients across subsamples.

The first empirical specification considers the traditional gravitational variables, i.e., the size of origin and destination countries and the distance between them, as sole determinants of international equity investment. These variables explain approximately 38% of the variability of international equity investment. The results show that destination country size and geographical distance are important determinants of international equity investment. Destination country size exerts a positive and significant influence on international equity investment, which suggests that investors prefer to hold equities from more developed countries in their portfolios. The distance between origin and destination countries exerts a negative and significant effect on international equity investment, indicating the preference of investors for equities of nearby countries and supporting the results of previous empirical studies (e.g. Al-Khail 2003, Bertaut and Kole 2004, Faruquee, Li and Yan 2004, Berkel 2007, Ferreira and Miguel 2007).

In the second empirical specification, the additional information costs variables are introduced, improving the fit of the regression from 38% to 49%. The results show that the additional information costs variables have all a positive and significant effect on international equity investment. This evidence highlights the important role of bilateral trade, transparency, contiguity, common language and common currency in reducing information costs and, hence, in enhancing international equity investment.

The third empirical specification considers, besides the traditional gravitational variables, the financial variables, namely the development, return and risk diversification potential of destination country equity market. The financial variables contribute to increase the percentage of international equity investment variability explained by the model from 38% to 45%. Thus, financial variables have explanatory power albeit lower than that of the additional information costs variables considered in the previous empirical specification.

The results suggest that investors prefer to hold equities from countries with more developed equity markets in their portfolios, which is consistent with the results of previous empirical studies (e.g. Amadi 2004b, Chan, Covrig and Ng 2005, Coeurdacier and Martin 2007, Berkel 2007, Ferreira and Miguel 2007, Lane and Milesi-Ferretti 2008, Aggarwal, Kearney and Lucey 2012). The results do not support, however, the return chasing behaviour of investors. Rather, the results show that investors exhibit the contrarian behaviour, as they hold more equities with lower past returns. Hamao and Mei (2001) and Diyarbakirlioglu (2011) also find a negative relationship between international equity investment and equity returns. Investors also tend to hold more equities with higher risk diversification potential. However, the

negative relationship between international equity investment and equity return correlation is not statistically significant.

The fourth empirical specification considers all variables. The coefficients of the independent variables exhibit the same sign and only geographical distance and common language lose their statistical significance in relation to previous empirical specifications. Thus, the results suggest the importance of destination country size, information costs (namely bilateral trade, destination country transparency, contiguity and common currency), as well as the development and return of destination country equity market, in the explanation of international equity investment. These variables only explain half of international equity investment variability, which is a bit short of expectations.

5.3.2 The determinants of international bond investment

The determinants of international bond investment are presented in table 5.5.

Table 5.5: Determinants of international bond investment

This table presents the determinants of international bond investment in the period 2001-2009. International bond investment is measured by the weight of destination country *j* in the total value of bonds held by investor *k* of origin country *i* in year *t* (natural logarithm). Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). For each independent variable, the regression coefficient, t-statistics and the respective statistical significance are displayed. The estimation is based on a OLS regression with cluster-robust standard errors, at the level of each origin country *i*. The last six lines present: the number of observations (N); F-statistics and the statistical significance for the model; the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); the Root Mean Squared Error (RMSE); and the Variance Inflation Factor (VIF). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)		(4)	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-19,089	-5,76***	-11,822	-4,27***	-28,014	-11,04***	-18,661	-9,05***
GDP	*it*	0,020	0,22	-0,0002	-0,00	0,065	0,68	0,028	0,32
GDP	*jt*	0,881	21,45***	0,369	5,85***	0,875	31,29***	0,392	4,86***
Distance	*ij*	-0,697	-9,23***	-0,085	-0,66	-0,578	-6,92***	-0,042	-0,32
Trade	*ijt*			0,647	6,68***			0,666	7,24***
Transparency	*jt*			0,274	7,08***			0,173	4,20***
Contiguity	*ij*			-0,075	-0,42			0,195	0,9
Language	*ij*			-0,384	-0,89			-0,212	-0,59
Currency	*ij*			0,991	4,43***			0,711	3,57***
Capitalisation	*jt*					1,213	14,09***	1,009	13,88***
Return	*jt*					0,174	3,60***	0,226	4,93***
Correlation	*ijt*					0,803	3,20***	0,208	1,11
N		8441		8441		8033		8033	
F		269,12***		156,27***		288,54***		333,24***	
R^2		0,329		0,460		0,471		0,542	
R_a^2		0,329		0,460		0,470		0,541	
RMSE		1,886		1,692		1,659		1,545	
Mean VIF		1,06		2,28		1,24		2,22	

The results concerning the first empirical specification show that international bond investment is significantly determined by destination country size, as well as by the geographical distance between origin and destination countries. In particular, the results suggest that investors prefer to hold bonds from more developed and geographically nearby countries, which goes in line with the results of previous empirical studies (e.g. Coeurdacier and Martin 2007, Daude and Fratzner 2008, Ferreira and Miguel 2011, Aggarwal, Kearney and Lucey 2012). The traditional gravitational variables are able to explain 33% of the variability of international bond investment.

The results for the second empirical specification, which includes the additional information costs variables, underline the important role of bilateral trade, destination country transparency and common currency, in reducing information costs and, as a consequence, in increasing international bond investment. Thus, institutional investors prefer to hold bonds from trade partners, from more transparent countries and from countries that share the same currency (euro)[64]. Curiously, contiguity and common language tend to exert a negative, albeit not significant, influence on international bond investment.

The results of the third empirical specification, which considers the financial variables, show that international bond investment is positively and significantly determined by the development of destination country bond market, destination country bond yields, and the correlation between origin and destination countries bond yields. Thus, in line with the results of Coeurdacier and Martin (2007) and Aggarwal, Kearney and Lucey (2012), among others, investors prefer to hold bonds from countries with more developed bond markets in their portfolios. Investors also prefer to hold bonds with higher past returns, which is consistent with the return chasing behaviour and with the results of De Santis and Gérard (2006) and Ferreira and Miguel (2011). Moreover, investors hold more foreign bonds whose yields are positively correlated with domestic bond yields. This result runs against the risk diversification hypothesis. Nonetheless, it was also found by De Santis and Gérard (2006) and Ferreira and Miguel (2011).

Finally, the fourth empirical specification includes all variables. The coefficients of independent variables tend to maintain the sign and the statistical significance of the previous specifications. Only geographical distance and correlation between origin and destination countries bond yields lose their statistical significance in the last empirical specification. Therefore, the results conclude for the importance of destination country size, information

[64] This evidence goes in line with the results of previous empirical studies (e.g. De Santis and Gérard 2006, Coeurdacier and Martin 2007).

costs (namely bilateral trade, destination country transparency and common currency) and destination country bond market development and return in the determination of international bond investment. Together, these variables explain 54% of international bond investment variability.

5.3.3 The determinants of international equity and bond investment: differences between assets

Table 5.6 presents the differences in the determinants of international equity and bond investment.

The results of the first empirical specification suggest that destination country size affects significantly more international equity investment than international bond investment, which is consistent with the result of Coeurdacier and Martin (2007). The influence of origin country size and geographical distance between origin and destination countries, although tendentiously stronger on international equity investment than on international bond investment, does not significantly differ between both types of assets.

The results of the second empirical specification show that the positive effects of bilateral trade and destination country transparency do not significantly differ between both types of assets, although they tend to be stronger on international equity investment than on international bond investment. De Santis and Gérard (2006) and Coeurdacier and Martin (2007) also find that bilateral trade tends to exert a stronger influence on international equity investment, although they do not provide a statistical significance for the difference. Daude and Fratzner (2008) also find that destination country transparency tends to exert a stronger influence on international equity investment relative to international bond investment, with the difference not being statistically significant.

The effects of contiguity and common language on international equity investment are found to be significantly stronger than on international bond investment, whereas the inverse result is found for common currency. Coeurdacier and Martin (2007), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012) find the same result for common language, although Daude and Fratzscher (2008) find that the difference is not statistically significant (the other authors do not provide a statistical significance for the difference). On the contrary, the effect of common currency on international bond investment is found to be significantly stronger than on international equity investment, which is consistent with the results found by De Santis and Gérard (2006) and Coeurdacier and Martin (2007). According to Coeurdacier and

Table 5.6: Differences in the determinants of international equity and bond investment

This table presents the differences in the determinants of international equity and bond investment in the period 2001-2009. International investment is measured by the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*, that considers: the independent variables; a dummy variable d, that equals one for bond and zero for equity; differential independent variables, that equal the product of each independent variable by the dummy variable d. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. The second column presents the dimension of each independent variable (i.e. if it varies at the level of each asset *a*, origin country *i*, destination country *j* and/or year of investment *t*). Within each empirical specification, (1) to (4), the first and second columns display the regression coefficient of each independent variable for equity investment and t-statistics, respectively, while the third and fourth columns display the regression coefficient of each differential independent variable (i.e. the difference between bond and equity investment) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)				(2)				(3)				(4)			
		Equity		Bond *vs* Equity		Equity		Bond *vs* Equity		Equity		Bond *vs* Equity		Equity		Bond *vs* Equity	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-27,080	-9,06***	7,990	3,64***	-18,167	-7,88***	6,345	3,44***	-26,377	-9,77***	-1,637	-0,93	-18,014	-7,13***	-0,647	-0,34
GDP	*it*	0,063	0,6	-0,043	-0,63	-0,006	-0,07	0,006	0,09	0,137	1,46	-0,072	-1,01	0,044	0,53	-0,015	-0,22
GDP	*jt*	1,148	17,69***	-0,267	-4,89***	0,595	7,05***	-0,225	-2,67**	0,919	18,63***	-0,043	-0,85	0,518	6,07***	-0,126	-1,4
Distance	*ij*	-0,789	-7,46***	0,092	1,4	-0,092	-0,85	0,007	0,08	-0,843	-8,14***	0,265	3,13***	-0,203	-1,68	0,160	1,54
Trade	*ijt*					0,712	7,68***	-0,065	-0,51					0,612	6,30***	0,054	0,49
Transparency	*jt*					0,296	9,79***	-0,021	-0,74					0,133	5,89***	0,040	1,01
Contiguity	*ij*					0,425	2,17**	-0,500	-2,19**					0,525	2,83**	-0,331	-1,72
Language	*ij*					0,485	2,55**	-0,869	-2,19**					0,287	1,37	-0,498	-1,85*
Currency	*ij*					0,455	2,04*	0,536	2,78**					0,462	2,16**	0,249	1,33
Capitalisation	*ajt*									1,054	8,53***	0,160	1,22	0,717	7,17***	0,293	2,20**
Return	*ajt*									-0,040	-9,91***	0,214	4,46***	-0,025	-6,54***	0,250	5,39***
Correlation	*aijt*									-0,273	-0,9	1,077	4,13***	-0,258	-0,85	0,466	1,49
N		16377				16374				15796				15793			
R^2		0,354				0,478				0,460				0,521			
R_a^2		0,354				0,478				0,460				0,521			
RMSE		1,931				1,735				1,728				1,627			

Martin (2007) this is not a surprising result since "exchange rate risk is a much larger part of the risk in foreign bond returns than in equity returns" (Coeurdacier and Martin, 2007, pp. 23).

Regarding the third empirical specification, the results indicate that the influence of destination country market development does not significantly differ between both types of assets, although it tends to be slightly higher on international bond investment. On the contrary, the effect of destination country returns significantly differs between both types of assets. In fact, as previously noticed, international equity (bond) investment is negatively (positively) affected by equity (bond) returns, consistent with the contrarian (return-chasing) behaviour of investors. The influence of returns on international bond investment is now found to be higher than on international equity investment, corroborating the result of De Santis and Gérard (2006). The effect of the correlation between origin and destination countries returns is also found to be significantly stronger on international bond investment than on international equity investment. Note that international equity (bond) investment is negatively (positively) affected by return correlation, consistent with (contrary to) the motivation for risk diversification.

In the fourth empirical specification the differences in the determinants of international equity and bond investment tend to remain, although there are some changes in their statistical significance. The differences at the level of destination country size, contiguity, common currency and return correlation lose statistical significance. On the contrary, the difference at that level of destination country market development gains statistical significance. Particularly, the effect of destination country market development on international bond investment is significantly higher than on international equity investment. Overall, in this final specification, only the effects of common language as well as destination country market development and return are significantly different between both types of assets: the former is significantly stronger for equity than for bond investment, whereas the latter are significantly stronger for bond than for equity investment. Thus, the results do not allow to either support or reject the argument that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others.

5.4 Robustness tests

This section tests the robustness of results to the consideration of different business cycles, as well as to the consideration of different types of investors.

5.4.1 Robustness to the consideration of business cycles

Business cycles are identified according to the chronology of euro area business cycles, provided by the Centre for Economic Policy Research (CEPR). The CEPR identifies a trough in the third quarter of 1993, a peak in the first quarter of 2008 and again a trough in the second quarter of 2009. Since business cycles of expansion are formally identified between troughs and peaks, the period 2001-2007 is considered to lie within a business cycle of expansion. Since business cycles of recession are formally identified between peaks and troughs, the period 2008-2009 is considered to lie within a business cycle of recession. In what follows, the robustness of results to the consideration of different business cycles (expansion and recession) is verified. For the sake of simplicity, only the results of the fourth empirical specification, which contains all independent variables, are shown.

5.4.1.1 Expansion cycles

Table 5.7 presents the determinants of international equity and bond investment in business cycles of expansion (2001-2007), as follows: model (1) focuses on international equity investment; model (2) focuses on international bond investment; and model (3) presents the differences between international equity and bond investment.

Estimates of model (1) show that international equity investment in business cycles of expansion is positively and significantly determined by destination country size, as well as by information costs variables, namely bilateral trade, destination country transparency, contiguity and common currency. The results also highlight the role of destination country equity market development in attracting international equity investment. Furthermore, the results support the contrarian behaviour of investors in so far as international equity investment is negatively and significantly affected by the return on destination country equity market index. Hence, the results in business cycles of expansion tend to mirror those obtained in the global period.

In turn, estimates of model (2) show that international bond investment in business cycles of expansion is positively and significantly determined by destination country size, as well as by information costs variables, namely bilateral trade, destination country transparency and common currency. Furthermore, international bond investment in business cycles of expansion is positively and significantly determined by the development of destination country bond market, as well as by destination country bond yields (which is consistent with the return

Table 5.7: Determinants of international equity and bond investment in business cycles of expansion

This table presents: in model (1), the determinants of international equity investment in business cycles of expansion; in model (2), the determinants of international bond investment in business cycles of expansion; in model (3), the differences in the determinants of international equity and bond investment in business cycles of expansion. International investment is measured by the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. Second column presents the dimension of each independent variable (i.e., if it varies at the level of each asset *a*, origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for bond and zero for equity) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)	
		Equity		Bond		Bond vs Equity	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-15,298	-6,59***	-17,222	-8,95***	-1,923	-1,16
GDP	*it*	0,003	0,04	0,002	0,02	-0,001	-0,01
GDP	*jt*	0,411	4,64***	0,362	4,80***	-0,049	-0,57
Distance	*ij*	-0,120	-0,93	-0,025	-0,19	0,095	0,89
Trade	*ijt*	0,704	6,88***	0,678	7,35***	-0,026	-0,23
Transparency	*jt*	0,085	3,75***	0,185	4,31***	0,099	2,30**
Contiguity	*ij*	0,532	3,11***	0,157	0,74	-0,375	-1,86*
Language	*ij*	0,214	1,03	-0,250	-0,71	-0,464	-1,64
Currency	*ij*	0,453	2,14**	0,820	4,51***	0,367	1,87*
Capitalisation	*ajt*	0,921	7,45***	1,016	14,14***	0,096	0,65
Return	*ajt*	-0,019	-5,24***	0,215	4,88***	0,234	5,18***
Correlation	*aijt*	-0,200	-0,45	0,074	0,33	0,273	0,67
N		5917		5987		11904	
R^2		0,522		0,554		0,537	
R_a^2		0,521		0,553		0,536	
RMSE		1,682		1,514		1,600	

chasing behaviour of investors). Thus, the results obtained in business cycles of expansion are similar to those obtained in the global period.

The differences in the determinants of international equity and bond investment in business cycles of expansion are presented in model (3). The results suggest that the effects of the size of origin and destination country, as well as the effect of geographical distance, on international equity investment tends to be slightly higher than on international bond investment. Yet, the differences are not statistically significant. Within the additional information costs variables, only the positive effects of destination country transparency, contiguity and common currency significantly differs between both types of assets. In particular, the effects of destination country transparency and common currency are found to be significantly stronger on international bond investment, whereas the effect of contiguity is

found to be significantly stronger on international equity investment. Thus, the results do not allow to either support or reject the argument that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others. In relation to the financial variables, only the effect of destination country returns significantly differs between both types of assets. In fact, as previously noticed, equity (bond) returns have a negative (positive) effect on international equity (bond) investment. Moreover, the positive effect of returns on bond investment is significantly stronger than its negative effect on equity investment.

Overall, the effect of contiguity is significantly stronger on international equity investment, while the effects of common currency, destination country transparency and destination country returns are significantly stronger on international bond investment. In relation to the results obtained in the global period, the differences by type of asset at the level of common language and destination country market development lose their statistical significance, whereas the differences at the level of destination country transparency, contiguity and common currency gain statistical significance, in business cycles of expansion.

5.4.1.2 Recession cycles

Table 5.8 presents the determinants of international equity and bond investment in business cycles of recession (2008-2009).

Model (1) presents the determinants of international equity investment in business cycles of recession. The results show that origin and destination country size have a positive and significant effect on international equity investment, suggesting that, in business cycles of recession, investors from more developed countries assign higher weights to each destination country equities, specially to those from more developed countries. The results also show that geographical distance between origin and destination countries exerts a negative and significant influence on international equity investment, indicating that, in business cycles of recession, investors assign significant higher weights to equities from nearby countries. Bilateral trade, destination country transparency and contiguity also significantly contribute to reduce information costs and enhance international equity investment in business cycles of recession. The financial variables, particularly the development and the return of the destination country equity market, also matter. In business cycles of recession, investors prefer to hold equities from countries with more developed equity markets, as well as they exhibit the contrarian behaviour.

Table 5.8: Determinants of international equity and bond investment in business cycles of recession

This table presents: in model (1), the determinants of international equity investment in business cycles of recession; in model (2), the determinants of international bond investment in business cycles of recession; in model (3), the differences in the determinants of international equity and bond investment in business cycles of recession. International investment is measured by the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of each asset *a*, origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for bond and zero for equity) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)	
		Equity		Bond		Bond vs Equity	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-24,557	-7,95***	-28,073	-6,34***	-3,516	-0,81
GDP	*it*	0,196	1,82*	0,161	1,34	-0,035	-0,33
GDP	*jt*	0,707	7,16***	0,648	4,96***	-0,058	-0,49
Distance	*ij*	-0,361	-3,32***	-0,228	-1,34	0,133	0,96
Trade	*ijt*	0,467	3,90***	0,465	3,87***	-0,003	-0,03
Transparency	*jt*	0,161	5,29***	0,110	2,02*	-0,051	-1,02
Contiguity	*ij*	0,653	2,64**	0,354	1,20	-0,299	-1,36
Language	*ij*	0,238	0,88	0,010	0,02	-0,228	-0,77
Currency	*ij*	0,283	1,14	0,340	1,17	0,058	0,23
Capitalisation	*ajt*	0,557	4,11***	1,065	11,88***	0,508	2,87**
Return	*ajt*	-0,069	-6,80***	0,270	4,80***	0,339	5,69***
Correlation	*aijt*	-1,519	-1,39	0,588	3,29***	2,107	1,86*
N		1843		2046		3889	
R^2		0,475		0,527		0,502	
R_a^2		0,472		0,525		0,499	
RMSE		1,730		1,603		1,664	

In relation to the results obtained for the global period, origin country size and geographical distance gain statistical significance, whereas common currency loses statistical significance, in business cycles of recession[65].

Model (2) presents the determinants of international bond investment in business cycles of recession. The results show that, in business cycles of recession, international bond investment is positively and significantly determined by destination country size, bilateral

[65] Appendix 5.1 compares the determinants of international equity investment in business cycles of recession and in business cycles of expansion. The results uncover statistically significant differences in the determinants of international equity investment by business cycles. In particular, the size of origin and destination countries, as well as geographical distance and destination country transparency, matter relatively more in business cycles of recession. The contrarian behaviour of investors is also relatively more severe in business cycles of recession. On the contrary, bilateral trade and the development of destination country equity market matter relatively more in business cycles of expansion. Furthermore, the significant difference at the level of the constant suggests that the weight assigned to each destination country equities is significantly lower in business cycles of recession. Thus, investors somewhat care about risk diversification.

trade and destination country transparency, as well as by all the financial variables considered (i.e., destination country bond market development, destination country bond yields and the correlation between origin and destination country bond yields). In relation to the results obtained in the global period, the correlation between origin and destination countries bond yields gains statistical significance, whereas common currency loses statistical significance, in business cycles of recession[66].

Model (3) presents the differences in the determinants of international equity and bond investment in business cycles of recession. The results show that only the differences at the level of financial variables are statistically significant. In particular, the positive effect of destination country market development on international bond investment is significantly stronger than on international equity investment. The positive effect of destination country returns on international bond investment is also found to be significantly stronger than its negative effect on international equity investment. On the contrary, the negative effect of the correlation between origin and destination country returns on international equity investment is found to be stronger than its positive effect on international bond investment.

The results also suggest that the effects of the size of origin and destination countries on international equity investment tend to be slightly higher than on international bond investment, but the differences are not statistically significant. Similarly, the results concerning the information costs variables suggest that the effects of geographical distance, bilateral trade, transparency, contiguity and common language tend to be higher for international equity investment, whereas the positive effect of common currency tends to be higher for international bond investment. Yet, none of the differences are statistically significant. Therefore, the results do not allow to either support or reject the argument that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others.

In relation to the results obtained in the global period, the difference at the level of common language loses statistical significance, whereas the difference at the level of the

[66] The same can be observed when comparing the results obtained in business cycles of recession to those obtained in business cycles of expansion. This suggests that the relative importance of the correlation between origin and destination countries bond yields (common currency) is potentially higher in business cycles of recession (expansion). The analysis of the differences in the determinants of international bond investment between business cycles, presented in Appendix 5.2, confirm the expectations. Moreover, it also uncovers other significant differences at the level of the size of origin and destination countries, geographical distance and bilateral trade. While the latter is found to be relatively more important in business cycles of expansion, the former are found to be relatively more important in business cycles of recession. There is also a significant difference at the level of the constant, which suggests that the weight assigned to each destination country bonds is significantly lower in business cycles of recession.

correlation between origin and destination country returns gains statistical significance, in business cycles of recession.

5.4.2 Robustness to the consideration of different types of investors

Previous results considered simultaneously institutional and noninstitutional investors. Since the latter are, by nature, less informed and sophisticated than the former, their international equity and bond investment could be more sensitive to information costs and familiarity. Therefore, in what follows, the robustness of results is tested by considering separately institutional and noninstitutional investors.

5.4.2.1 Institutional investors

Table 5.9 presents the determinants of international equity and bond investment of institutional investors.

Model (1) focuses on the determinants of international equity investment of institutional investors. The results suggest that international equity investment of institutional investors is positively and significantly determined by destination country size, as well as by bilateral trade, destination country transparency, contiguity and common language, which proxy for information costs. The financial variables also matter. In particular, international equity investment of institutional investors is positively and significantly determined by the development of destination country equity market and negatively and significantly determined by the return on destination country equity market index (consistent with the contrarian behaviour). Thus, the results on the determinants of international equity investment of institutional investors mirror those obtained for all investors.

In turn, model (2) focuses on the determinants of international bond investment of institutional investors. The results support the important role of destination country size, as well as information costs (namely bilateral trade, destination country transparency and common currency) in the determination of international bond investment of institutional investors.

Table 5.9: Determinants of international equity and bond investment of institutional investors

This table presents: in model (1), the determinants of international equity investment of institutional investors; in model (2), the determinants of international bond investment of institutional investors; in model (3), the differences in the determinants of international equity and bond investment of institutional investors. International investment is measured by the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. Second column presents the dimension of each independent variable (i.e. if it varies at the level of each asset *a*, origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for bond and zero for equity) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Equity		Bond		Bond vs Equity	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-15,417	-6,10***	-15,990	-6,90***	-0,573	-0,27
GDP	*it*	-0,010	-0,14	-0,041	-0,49	-0,031	-0,44
GDP	*jt*	0,504	5,84***	0,375	5,40***	-0,129	-1,45
Distance	*ij*	-0,160	-1,33	-0,018	-0,14	0,142	1,36
Trade	*ijt*	0,595	5,63***	0,642	7,18***	0,047	0,39
Transparency	*jt*	0,067	2,72**	0,104	2,43**	0,037	0,93
Contiguity	*ij*	0,342	1,94*	0,187	0,89	-0,155	-0,82
Language	*ij*	0,226	1,01	-0,208	-0,52	-0,434	-1,46
Currency	*ij*	0,398	1,78*	0,793	4,21***	0,395	2,36**
Capitalisation	*ajt*	0,621	6,32***	1,054	14,28***	0,433	3,24***
Return	*ajt*	-0,019	-4,31***	0,192	4,66***	0,211	4,98***
Correlation	*aijt*	-0,294	-0,98	0,320	1,81*	0,614	1,68
N		5119		5697		10816	
R^2		0,490		0,589		0,541	
R_a^2		0,489		0,588		0,540	
RMSE		1,616		1,417		1,514	

The results also show that international bond investment of institutional investors is positively and significantly determined by the development of destination country bond market, destination country bond yields and the correlation between origin and destination country bond yields. In relation to the results obtained when all investors were considered, only the correlation between origin and destination country bond yields gains statistical significance when only institutional investors are considered. For all other variables, the results for institutional investors mirror those obtained for all investors.

Model (3) presents the differences in the determinants of international equity and bond investment of institutional investors. The results show that the effect of origin and destination country size on international investment does not significantly differ between both types of assets. The results concerning information costs show that only the positive effect of common currency on international investment differs significantly between both types of assets.

Particular, the effect of common currency on international bond investment is significantly stronger than on international equity investment. For all other information costs variables the differences are not statistically significant; notwithstanding, the coefficients of bilateral trade and transparency are larger for international bond investment, while the coefficients of geographical distance, contiguity and common language are larger for international equity investment. Therefore, the results do not allow to either support or reject the argument that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others. The results for the financial variables show that the effects of the development and return of destination country market on international bond investment are significantly stronger than on international equity investment[67].

Overall, only common currency and the development and return of destination country financial market have a significantly different impact on international equity and bond investment, which is found to be stronger for the latter than for the former. Thus, for institutional investors, there is no evidence that international equity investment is much more information intensive than international bond investment. In relation to the results obtained when all investors are considered, the difference at the level of common currency (language) gains (loses) statistical significance, when only institutional investors are considered.

5.4.2.2 Noninstitutional investors

Table 5.10 presents the determinants of international equity and bond investment of noninstitutional investors.

Estimates of model (1) show that international equity investment of noninstitutional investors is positively and significantly determined by destination country size, as well as by geographical proximity, bilateral trade, destination country transparency, contiguity and common currency. International equity investment of noninstitutional investors is also significantly determined by the development and the return of destination country equity market[68].

[67] Note that equity (bond) returns negatively (positively) affect international equity (bond) investment of institutional investors.

[68] The development and the return of destination country equity market exert a positive and a negative effect on international equity investment, respectively.

Table 5.10: Determinants of international equity and bond investment of noninstitutional investors

This table presents: in model (1), the determinants of international equity investment of noninstitutional investors; in model (2), the determinants of international bond investment of noninstitutional investors; in model (3), the differences in the determinants of international equity and bond investment of noninstitutional investors. International investment is measured by the weight of destination country *j* in the total value of asset *a* held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown in the first column. A detailed description of independent variables is provided in table 5.1. The second column presents the dimension of each independent variable (i.e., if it varies at the level of each asset *a*, origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for bond and zero for equity) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the Root Mean Squared Error (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Equity		Bond		Bond vs Equity	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-24,162	-5,65***	-27,237	-7,47***	-3,075	-0,65
GDP	*it*	0,120	0,83	0,212	1,69	0,092	0,68
GDP	*jt*	0,635	6,23***	0,500	3,42***	-0,135	-0,86
Distance	*ij*	-0,395	-3,44***	-0,183	-0,98	0,212	1,26
Trade	*ijt*	0,571	5,64***	0,695	5,48***	0,125	0,86
Transparency	*jt*	0,273	8,07***	0,387	8,64***	0,114	1,97*
Contiguity	*ij*	0,891	3,79***	0,183	0,56	-0,709	-2,30**
Language	*ij*	0,334	1,65	-0,290	-0,81	-0,625	-2,00*
Currency	*ij*	0,642	2,27**	0,592	2,28**	-0,050	-0,15
Capitalisation	*ajt*	0,954	8,88***	0,925	8,80***	-0,030	-0,18
Return	*ajt*	-0,037	-8,04***	0,328	4,99***	0,365	5,60***
Correlation	*aijt*	-0,246	-0,43	-0,180	-0,70	0,066	0,15
N		2641		2336		4977	
R^2		0,585		0,503		0,552	
R_a^2		0,583		0,501		0,550	
RMSE		1,717		1,723		1,719	

Compared to the results obtained when all investors were considered, geographical distance gains statistical significance when only noninstitutional investors are considered, supporting the idea that international equity investment of noninstitutional investors is more sensitive to information costs.

In turn, estimates of model (2) show that international bond investment of noninstitutional investors is positively and significantly determined by destination country size, as well as by bilateral trade, destination country transparency and common currency, which proxy for information costs. Furthermore, international bond investment of noninstitutional investors is also positively and significantly determined by the development and return of destination country bond market. The results on determinants of international bond investment of noninstitutional investors thus mirror those obtained when all investors are considered.

The differences in the determinants of international equity and bond investment of noninstitutional investors are presented in model (3). The results suggest that the effects of the size of origin and destination countries on international investment do not significantly differ between both types of assets.

With respect to the information costs variables, the results show that the negative effect of geographical distance on international equity investment tends to be slightly higher than on international bond investment, albeit the difference is not statistically significant. Within the additional information costs variables, only the effects of destination country transparency, contiguity and common language on international investment differ significantly between both types of assets. Particularly, the effect of destination country transparency on international bond investment is significantly stronger than on international equity investment, while the effect of contiguity and common language on international equity investment is significantly stronger than on international bond investment. Hence, once more, the results do not allow to either support or reject the argument that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others.

Regarding the financial variables, the results show that the effect of destination country returns is stronger for bond than for equity investment[69]. The differences at the level of the development of destination country market and the correlation between origin and destination countries returns are not statistically significant.

Overall, the effects of destination country transparency and equity market return on international bond investment are significantly stronger than on international equity investment. On the contrary, the effect of contiguity and common language on international equity investment is significantly stronger than on international bond investment. Thus, for noninstitutional investors, there is no evidence that international equity investment is much more information intensive than international bond investment. In relation to the results obtained when all investors are considered, the differences by type of asset at the level of destination country transparency and contiguity gain statistical significance, whereas destination country market development loses statistical significance when only noninstitutional investors are considered.

[69] Note that equity (bond) returns have a negative (positive) effect on international equity (bond) investment of noninstitutional investors.

5.5 Conclusion

The objectives of this chapter were threefold. First, to investigate the determinants of international equity investment. Second, to investigate the determinants of international bond investment. Third, to investigate the differences in the determinants of international equity and bond investment. For this purpose, a gravity-model was applied to the international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries, at the end of years 2001 to 2009. Additionally, the robustness of results to the consideration of different business cycles (expansion and recession), as well as to the consideration of different types of investors (institutional and noninstitutional investors) was also verified.

The results reinforce the role of destination country size, information costs, as well as destination country financial market development and return, in the determination of both international equity and bond investment.

The results also suggest that there are few significant differences in the determinants of international equity and bond investment. In fact, when all size, information costs and financial variables are included in the model, the results show that only the effects of common language, as well as destination country market development and return, are significantly different between assets: the former is significantly stronger for equity than for bond investment, whereas the latter are significantly stronger for bond than for equity investment.

In summary, although the effect of information costs on international equity investment tends to be stronger than on international bond investment, the differences between assets are not usually statistically significant, especially when the financial variables are taken into account. Therefore, the results do not allow to either support or reject the argument that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others.

Moreover, the results are quite sensitive to the consideration of different business cycles, as well as to the consideration of different types of investors. In business cycles of expansion, destination country transparency, common currency and destination country return are found to be significantly more important for international bond investment, whereas contiguity is found to be significantly more important for international equity investment. In turn, in business cycles of recession, only differences within financial variables are found to be significant: the development and the return of destination country financial market are more important for international bond investment, while destination country risk diversification potential is more important for international equity investment. For institutional

investors, common currency, as well as the development and the return of destination country market are found to be significantly stronger for bond than for equity investment. In turn, for noninstitutional investors, destination country transparency and return are significantly stronger for bond than for equity investment, whereas contiguity and common language are significantly stronger for equity than for bond investment.

The empirical analysis carried out in this chapter offers important contributions to the literature. First, by distinguishing international equity and bond investment, it provides an analysis of the differences in the determinants of international investment between assets and, above all, it provides a statistical significance for the differences in both. In fact, the majority of empirical studies have focused on the determinants of international equity investment and, to a lesser extent, on the determinants of international bond investment, without providing a comparison of those determinants by type of asset. The studies of Portes, Rey and Oh (2001), DeSantis and Gérard (2006), Coeurdacier and Martin (2007), Daude and Fratzscher (2008) and Aggarwal, Kearney and Lucey (2012) analyse the determinants of both international equity and bond investment and therefore set the conditions for a comparison of those determinants between assets. However, these studies are limited since, with exception of Daude and Fratzscher (2008), they do not provide the statistical significance of the differences found. The empirical analysis carried out in this chapter shows that, although the effect of information costs on international equity investment tends to be stronger than on international bond investment, the differences between both types of assets are not usually statistically significant and, therefore, it is not possible to conclude that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others. These findings draw attention to the need of testing the statistical significance of the differences in so far as the mere comparison of the coefficients may lead to incorrect conclusions.

Second, by using a continuous 9 year period of data, the influence of business cycles in the determinants of both international equity and bond investment is also taken into account. This issue has not been addressed by previous studies, since they only consider one year (e.g. Coeurdacier and Martin 2007), two years (e.g. De Santis and Gérard 2006), or three or more discontinuous years of investment analysis (e.g. Daude and Fratzner 2008).

Third, by using data disaggregated by type of investor, the influence of investors' characteristics in the determinants of both international equity and bond investment is also taken into account. This issue has not been explored so far, as previous studies tend to consider aggregated data for all investors within each origin country (e.g. De Santis and Gérard

2006, Coeurdacier and Martin 2007, Daude and Fratzscher 2008, Aggarwal, Kearney and Lucey 2012).

The empirical analysis carried out in this chapter shows that the differences between international equity and bond investment are sensitive to the consideration of different business cycles (expansion and recession), as well as to the consideration of investors with different characteristics (institutional and noninstitutional investors). Hence, these findings draw attention to the need of disaggregating the data by business cycles and by type of investors.

Appendices

Appendix 5.1
Determinants of international equity investment by business cycles

This table presents: in model (1), the determinants of international equity investment in business cycles of expansion; in model (2), the determinants of international equity investment in business cycles of recession; model (3), the differences in the determinants of international equity investment between business cycles of recession and business cycles of expansion. International equity investment is measured by the weight of destination country *j* in the international equity portfolio held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown is the first column. A detailed description of independent variables is provided in table 5.1. Second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for business cycles of recession and zero for business cycles of expansion) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the *Root Mean Squared Error* (RMSE). Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

		(1)		(2)		(3)	
		Expansion		Recession		Recession vs Expansion	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-15,298	-6,59***	-24,557	-7,95***	-9,259	-4,05***
GDP	*it*	0,003	0,04	0,196	1,82*	0,193	2,92***
GDP	*jt*	0,411	4,64***	0,707	7,16***	0,296	3,30***
Distance	*ij*	-0,120	-0,93	-0,361	-3,32***	-0,242	-2,94***
Trade	*ijt*	0,704	6,88***	0,467	3,90***	-0,236	-2,71**
Transparency	*jt*	0,085	3,75***	0,161	5,29***	0,076	2,56**
Contiguity	*ij*	0,532	3,11***	0,653	2,64**	0,121	0,75
Language	*ij*	0,214	1,03	0,238	0,88	0,025	0,13
Currency	*ij*	0,453	2,14**	0,283	1,14	-0,170	-1,7
Capitalisation	*jt*	0,921	7,45***	0,557	4,11***	-0,364	-3,31***
Return	*jt*	-0,019	-5,24***	-0,069	-6,80***	-0,050	-5,63***
Correlation	*ijt*	-0,200	-0,45	-1,519	-1,39	-1,320	-1,63
N		5917		1843		7760	
R^2		0,522		0,475		0,511	
R_a^2		0,521		0,472		0,510	
RMSE		1,682		1,730		1,694	

Appendix 5.2
Determinants of international bond investment by business cycles

This table presents: in model (1), the determinants of international bond investment in business cycles of expansion; in model (2), the determinants of international bond investment in business cycles of recession; model (3), the differences in the determinants of international bond investment between business cycles of recession and business cycles of expansion. International bond investment is measured by the weight of destination country *j* in the international bond portfolio held by investor *k* of origin country *i* in year *t* (natural logarithm). The estimation is based on a OLS regression, with cluster-robust standard errors at the level of each origin country *i*. Independent variables are shown is the first column. A detailed description of independent variables is provided in table 4.1. Second column presents the dimension of each independent variable (i.e. if it varies at the level of each origin country *i*, destination country *j* and/or year of investment *t*). Within models (1) and (2), the first and second columns display the regression coefficient of each independent variable and t-statistics, respectively. Within model (3), the first and second columns display the regression coefficient of each differential independent variable (i.e., the product of each independent variable by a dummy variable d, that equals one for business cycles of recession and zero for business cycles of expansion) and t-statistics, respectively. The last four lines present: the number of observations (N); the coefficient of determination or R-squared (R^2); adjusted R-squared (R_a^2); and the *Root Mean Squared Error* (RMSE). Statistical Significance: * $\mathrm{p} < 0{,}1$; ** $\mathrm{p} < 0{,}05$; *** $\mathrm{p} < 0{,}01$.

		(1)		(2)		(3)	
		Expansion		Recession		Recession vs Expansion	
Variable	Dim.	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Constant		-17,222	-8,95***	-28,073	-6,34***	-10,851	-3,19***
GDP	*it*	0,002	0,02	0,161	1,34	0,159	2,26**
GDP	*jt*	0,362	4,80***	0,648	4,96***	0,286	3,45***
Distance	*ij*	-0,025	-0,19	-0,228	-1,34	-0,203	-2,36**
Trade	*ijt*	0,678	7,35***	0,465	3,87***	-0,213	-3,14***
Transparency	*jt*	0,185	4,31***	0,110	2,02*	-0,074	-1,57
Contiguity	*ij*	0,157	0,74	0,354	1,20	0,197	1,02
Language	*ij*	-0,250	-0,71	0,010	0,02	0,260	1,35
Currency	*ij*	0,820	4,51***	0,340	1,17	-0,479	-2,92***
Capitalisation	*jt*	1,016	14,14***	1,065	11,88***	0,048	0,59
Return	*jt*	0,215	4,88***	0,270	4,80***	0,055	1,59
Correlation	*ijt*	0,074	0,33	0,588	3,29***	0,514	2,06*
N		5987		2046		8033	
R^2		0,554		0,527		0,547	
R_a^2		0,553		0,525		0,545	
RMSE		1,514		1,603		1,537	

Chapter 6: The flight to quality phenomenon

6.1 Introduction

This chapter analyses the flight to quality phenomenon. According to Caballero and Kurlat (2008, pp.1), the term "flight to quality" is commonly used to describe "an environment where investors seek to sell assets perceived as risky and purchase safe assets instead". Beber, Brandt and Kavajecz (2009) refer that, in times of economic distress, it is common to observe investors rebalance their portfolios towards less risky assets, phenomenon known as flight to quality. Caballero and Kurlat (2008) review the related literature and conclude that, overall, it "tends to confirm the view that in periods of uncertainty or distress or bad news there is often a flight from risky assets like stocks to less risky assets like bonds" (Caballero and Kurlat, 2008, pp. 9).

Basically, the argument underlying the flight to quality phenomenon is that investors' rationality would lead them to increase the investment in less risky assets and decrease the investment in more risky assets, when economic conditions deteriorate. Although the rationale for the flight to quality phenomenon is pretty intuitive, empirical evidence on its prevalence is very scarce and mostly confined to domestic investment within a particular country. For instance, Kaul and Phillips (2007) find evidence of flight to quality in Canada. Specifically, they find that a deterioration (improvement) in Canadian economic conditions, causes investors to direct flows away from (towards) equity based funds and towards (out of) fixed income-type funds. More recently, Chalmers, Kaul and Phillips (2010) also find evidence of flight to quality for both United States and Canada, as reflected in a significant flow away from riskier equity funds and towards safer money market funds when economic conditions deteriorate and around major crises. Moreover, they provide evidence that more sophisticated investors show a more pronounced reaction to economic conditions and crises. The question is whether the flight-to-quality phenomenon is also observable in international investment.

The objectives of this chapter are twofold. First, by considering assets with different degrees of risk (equities and bonds) and different business cycles (expansions and recessions), to investigate weather in business cycles of recession investors tend to decrease international investment in assets with higher degree of risk (equities) and increase international investment in assets with lower degree of risk (bonds), according to the flight to quality phenomenon. Second, by additionally considering investors with different degrees of sophistication (institutional and noninstitutional investors), to investigate whether the flight to quality

phenomenon is more pronounced for more sophisticated (institutional) investors than for less sophisticated (noninstitutional) investors, as suggested by Chalmers, Kaul and Phillips (2010). For this purpose, a two-factor and three-factor ANOVA models, respectively, are applied to the international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries in the period 2001-2009, that comprises both business cycles of expansion and recession.

This chapter offers an important contribution to the literature in so far it presents the first attempt to analyse the flight to quality phenomenon at the level of international, rather than domestic, investment. Moreover, this research analyses whether the flight to quality phenomenon in international investment is more pronounced for more sophisticated investors than for less sophisticated investors. As far as I am aware of, only Chalmers, Kaul and Phillips (2010) address this question, yet at the level of domestic, rather than international, investment.

This chapter is organised as follows. Section 2 presents the research design, namely the sample, variables and estimation procedures. Section 3 presents and discusses the empirical results. Finally, section 4 concludes.

6.2 Research Design

6.2.1 Sample

The empirical analysis is based on international portfolio investment holdings data, collected by the Coordinated Portfolio Investment Survey (CPIS), under the auspices of the International Monetary Fund (IMF). The CPIS data can be disaggregated by: type of asset; sector of the asset holder; country of residence of the asset holder; country of residence of the asset issuer; and year of investment.

According to the type of asset, the CPIS breaks down international portfolio investment holdings by equity securities, long-term debt securities and short-term debt securities. Given the objective of this study, only holdings on equity securities and long-term debt securities (hereafter, bonds) are considered.

According to the sector of the asset holder (hereafter, type of investor), the CPIS breaks down international portfolio investment holdings by monetary authorities, banks, other financial institutions (including insurance, mutual funds and others), government, and nonfinancial sector (including nonfinancial companies, households and others). In this study, only holdings of banks and other financial institutions (institutional investors) and holdings of

the nonfinancial sector (noninstitutional investors) are considered. Monetary authorities and government are thus excluded from the sample.

As for the country of residence of the asset holder (hereafter, investment origin country) and country of residence of the asset issuer (hereafter, investment destination country), the CPIS considers several countries. However, taking into account the availability of data, only OECD countries are considered. Among these, Luxembourg[70], as well as countries that become members of OECD in 2010 (Chile, Estonia, Israel and Slovenia)[71] are excluded. International equity and bond investment holdings by sector of the holder country are not available for Belgium, Canada, Iceland, Ireland, Korea, Poland, Slovak Republic, Switzerland and United States and, as such, these countries are also excluded from the sample of investment origin countries.

Therefore, the sample of investment origin countries comprises 20 OECD countries, namely Australia, Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey and United Kingdom. In turn, the sample of investment destination countries comprises 29 OECD countries, namely Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

Concerning the years of investment, data on international portfolio investment holdings are available, on a yearly basis, for 1997 and from 2001 onwards. In this study, a continuous 9 year period is considered, namely from 2001 to 2009[72]. Within the period 2001-2009, the Centre for Economic Policy Research (CEPR) identifies one business cycle of recession, from the first quarter of 2008 (peak) to the second quarter of 2009 (trough). Thus, the period from 2001 to 2007 is associated to a business cycle of expansion, whereas the period from 2008 to 2009 is associated to a business cycle of recession[73].

[70] Lane and Milesi-Ferretti (2008) also excluded off-shore financial centers, such as Luxembourg. They argue that off-shore financial centers "act as pure intermediaries and are neither true sources nor final destinations of investment" Milesi-Ferretti (2008, pp. 543).

[71] These countries were excluded since they were not members of OECD in the time period under analysis (2001-2009).

[72] At the time of the last data collection, 2009 was the last year of available CPIS data.

[73] Business cycles of expansion are formally identified between troughs and peaks; business cycles of recession are formally identified between peaks and troughs.

6.2.2 Variables

To investigate the flight to quality phenomenon, the dependent variable is the weight of asset *a* in the total value of assets (equities plus bonds) of destination country *j* held by investor *k* of origin country *i* in year *t*, calculated as in equation 6.1:

$$w_{kiajt} = \frac{H_{kiajt}}{H_{kijt}}.100 \quad \textbf{(6.1)}$$

where: w_{kiajt} is the weight of asset *a* in the total value of assets (equities plus bonds) of destination country *j* held by investor *k* of origin country *i* in year *t*; H_{kiajt} is the value held by investor *k* of origin country *i* in asset *a* of destination country *j* in year *t*; e H_{kijt} is the total value of assets (equity plus bond) of destination country *j* held by investor *k* of origin country *i* in year *t*. Data is from CPIS IMF. It should be noted that, when computing the dependent variable, international holdings reported as unavailable, confidential, zero value or negative value (short-selling) were neglected.

Three categorical independent variables (or factors) are considered: (1) type of asset *a*, i.e., a dummy that takes the value one for bonds and zero for equities; (2) business cycle *c*, i.e., a dummy that takes the value one for business cycle of recession and zero for business cycle of expansion; and (3) type of investor *k*, a dummy that takes the value one for institutional investors and zero for noninstitutional investors.

6.2.3 Estimation

To investigate the flight to quality phenomenon, a two-way factor ANOVA model is used, as in equation 6.2:

$$w_{kiajt} = \mu + \alpha_a + \beta_c + \gamma_{ac} + \varepsilon_{kiajt} \quad \textbf{(6.2)}$$

where: w_{kiajt} is the weight of asset *a* in the total value of assets (equities plus bonds) of destination country *j* held by investor *k* of origin country *i* in year *t* (calculated as in equation 6.1); μ is the mean value of the dependent variable w_{kiajt} in the reference category of both factors; α_a is the main effect of factor type of asset *a*; β_c is the main effect of factor business cycle *c*; γ_{ac} is the two-way interaction effect of factors type of asset *a* and business cycle *c*; and ε_{kiajt} is the random error.

From the estimated parameters it is possible to compute the estimated marginal means of the dependent variable in each category of both factors. The average weight of equities (reference category of the factor type of asset) in business cycles of expansion (reference category of the factor business cycle) is given by μ. The average weight of equities in business cycles of recession is given by $\mu + \beta_c$. Therefore, β_c represents the difference between the weight assigned to equities in business cycles of recession and in business cycles of expansion. The average weight of bonds in business cycles of expansion is given by $\mu + \alpha_a$. Therefore, α_a represents the difference between the weight assigned to bonds and to equities in business cycles of expansion. Finally, the average weight of bonds in business cycles of recession is given by $\mu + \alpha_a + \beta_c + \gamma_{ac}$.

To investigate the flight to quality phenomenon by type of investor, a three-way factor ANOVA model is used, as in equation 6.3:

$$w_{kiajt} = \mu + \alpha_a + \beta_c + \delta_k + \gamma_{ac} + \theta_{ak} + \tau_{ck} + \varphi_{ack} + \varepsilon_{kiajt} \quad \textbf{(6.3)}$$

where: w_{kiajt} is the weight of asset *a* in the total value of assets (equities plus bonds) of destination country *j* held by investor *k* of origin country *i* in year *t* (calculated as in equation 6.1); μ is the mean value of the dependent variable w_{kiajt} in the reference category of the three factors; α_a is the main effect of factor type of asset *a*; β_c is the main effect of factor business cycle *c*; δ_k is the main effect of factor type of investor *k*; γ_{ac} is the two-way interaction effect of factors type of asset *a* and business cycle *c*; θ_{ak} is the two-way interaction effect of factors type of asset *a* and type of investor *k*; τ_{ck} is the two-way interaction effect of factors business cycle *c* and type of investor *k*; φ_{ack} is the three-way interaction effect of factors type of asset *a*, business cycle *c* and type of investor *k*; and ε_{kiajt} is the random error.

From the estimated parameters it is possible to compute the estimated marginal means of the dependent variable in each category of the three factors. The average weight assigned to equities (reference category of the factor type of asset) in business cycles of expansion (reference category of the factor business cycle) by noninstitutional investors (reference category of the factor type of investor) is given by μ. For institutional investors, that weight is given by $\mu + \delta_k$. The average weight assigned to equities in business cycles of recession by noninstitutional investors is given by $\mu + \beta_c$. For institutional investors, that weight is given by $\mu + \beta_c + \delta_k + \tau_{ck}$. The average weight assigned to bonds in business cycles of expansion by noninstitutional investors is given by $\mu + \alpha_a$. For institutional investors, that weight is given by $\mu + \alpha_a + \delta_k + \theta_{ak}$. The average weight assigned to bonds in business cycles of recession by

noninstitutional investors is given by $\mu + \alpha_a + \beta_c + \gamma_{ac}$. For institutional investors, that weight is given by $\mu + \alpha_a + \beta_c + \delta_k + \gamma_{ac} + \theta_{ak} + \tau_{ck} + \varphi_{ack}$.

6.3 Empirical Results

6.3.1 Flight to quality

Table 6.1 presents the parameter estimates of the two-factor ANOVA model.

Table 6.1: Flight to quality: parameter estimates

This table presents the parameter estimates of the two-factor ANOVA model, as well as the t-statistics and the respective statistical significance. The dependent variable is the weight of asset *a* in total value of assets (equities plus bonds) of destination country *j* held by investor *k* of origin country *i* in year *t*. The two factors are: type of asset (equities and bonds) and business cycle (expansion and recession). The model considers equities as the reference category of factor type of asset and expansion as the reference category of factor business cycle. According to equation 6.1, μ is the mean value of the dependent variable in the reference category of both factors; α_a is the main effect of factor type of asset *a*; β_c is the main effect of factor business cycle *c*; γ_{ac} is the two-way interaction effect of factors type of asset *a* and business cycle *c*. Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

Parameter	*Coef.*	*t-stat*
μ	35,42	79,48***
α_a	29,16	46,27***
β_c	-4,34	-4,88***
γ_{ac}	8,67	6,90***

The model considers equities as the reference category of factor type of asset and expansion as the reference category of factor business cycle. The parameter μ indicates the mean of the dependent variable in the reference category of both factors: thus, the average weight assigned to equities of each destination country in business cycles of expansion is 35%. The weight assigned to bonds of each destination country in business cycles of expansion is significantly higher than that assigned to equities in 29%. The change in business cycle from expansion to recession causes the weight assigned to equities of each destination country to decrease by 4%; that decrease is statistically significant. Note that the decrease in the weight assigned to equities of each destination country implies an increase in the weight assigned to bonds of each destination country of the same magnitude and statistical significance. Thus, the change in business cycle causes a significant increase in the average weight assigned to less risky assets (i.e. bonds) and a significant decrease in the average weight assigned to more risky assets (i.e. equities), which is consistent to the flight to quality phenomenon.

Table 6.2 presents the estimated marginal means of international investment within each category of the two factors considered – type of asset (equities and bonds) and business cycle (expansion and recession) –, as well as F-statistic and the respective statistical significance for the main and two-way interaction effect.

Table 6.2: Flight to quality: estimated marginal means

This table presents the value of estimated marginal means of international investment in each category of the two factors considered – type of asset (equities and bonds) and business cycle (expansion and recession) – , as well as the F-statistic and the respective statistical significance for the main and two-way interaction effects. International investment is measured by the weight of asset *a* in total value of assets (equity plus bond) of destination country *j* held by investor *k* of origin country *i* in year *t*. Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

Factor	Category	Mean	F-stat
Asset	Equity	33,25	2839***
	Bond	66,75	
Cycle	Expansion	50,00	0,00
	Recession	50,00	
Asset* Cycle	Equity*Expansion	35,42	47,54***
	Equity*Recession	31,08	
	Bond*Expansion	64,58	
	Bond*Recession	68,92	

The results show that the main effect of the factor type of assets is statistically significant and, on average, investors assign a higher weight to bonds than to equities of each destination country in their portfolio (67% against 33%, respectively).

The two-way interaction effect of factors type of asset and business cycle is also statistically significant. On average, investors assign higher weights to equities in business cycles of expansion (35%) than on business cycles of recession (31%) and they assign higher weights to bonds in business cycles of recession (69%) than on business cycles of expansion (65%). The same is to say that the average weight assigned to equities is reduced from 35% in business cycles of expansion to 31% in business cycles of recession, whereas the average weight assigned to bonds increases from 65% in business cycles of expansion to 69% in business cycles of recession. Thus, in business cycles of recession, investors tend to increase the weight invested in less risky assets (bonds) and decrease the weight invested in more risky assets (equities), which is consistent with the flight to quality phenomenon. This phenomenon is clearly illustrated by figure 6.1.

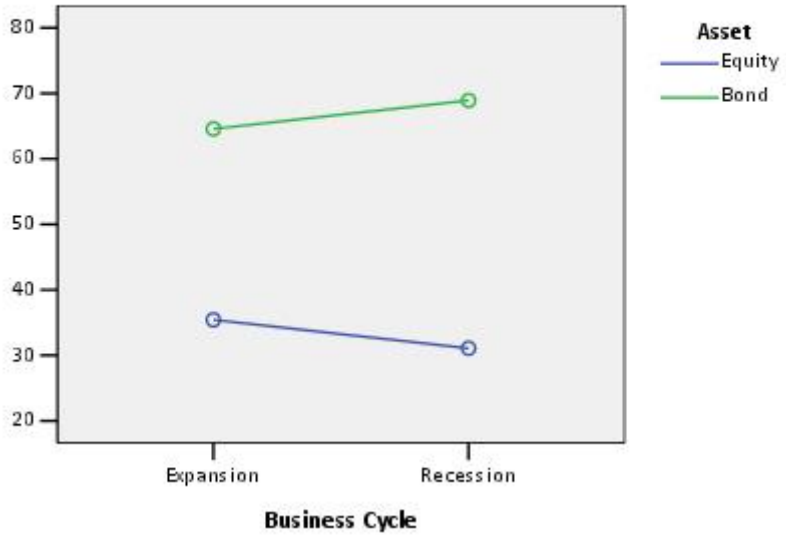

Figure 6.1: Flight to quality

This figure illustrates the estimated marginal means of the weight assigned to equity and to bond in different business cycles (expansion and recession). The value of estimated marginal means can be found in table 6.2.

6.3.2 Flight to quality by type of investor

Table 6.3 presents the parameter estimates of the three-factor ANOVA model, while table 6.4 presents the estimated marginal means of international investment within each category of the three factors considered – type of asset (equities and bonds), business cycle (expansion and recession) and type of investor (institutional and noninstitutional) –, as well as F-statistic and the respective statistical significance for the main, two-way and three-way interaction effects.

Table 6.3: Flight to quality by type of investor: parameter estimates

This table presents the parameter estimates of three-factor ANOVA model, as well as t-statistics and the respective statistical significance. The dependent variable is the weight of asset *a* in total value of assets (equities plus bonds) of destination country *j* held by investor *k* of origin country *i* in year *t*. The three factors are: type of asset (equities and bonds), business cycle (expansion and recession) and type of investor (institutional and noninstitutional). The model considers equities as the reference category of factor type of asset, expansion as the reference category of factor business cycle and noninstitutional investors as the reference category of the factor type of investor. According to equation 6.2, μ is the mean value of the dependent variable in the reference category of the three factors; α_a is the main effect of factor type of asset *a*; β_c is the main effect of factor business cycle *c*; δ_k is the main effect of factor type of investor *k*; γ_{ac} is the two-way interaction effect of factors type of asset *a* and business cycle *c*; θ_{ak} is the two-way interaction effect of factors type of asset *a* and type of investor *k*; τ_{ck} is the two-way interaction effect of factors business cycle *c* and type of investor *k*; φ_{ack} is the three-way interaction effect of factors type of asset *a*, business cycle *c* and type of investor *k*. Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

Parameter	*Coef.*	*t-stat*
μ	47,80	62,928***
α_a	4,39	4,089***
β_c	-3,07	-2,059**
δ_k	-18,25	-19,791***
γ_{ac}	6,13	2,912***
θ_{ak}	36,50	27,989***
τ_{ck}	-2,35	-1,287
φ_{ack}	4,69	1,821*

Table 6.4: Flight to quality by type of investor: estimated marginal means

This table presents the value of estimated marginal means of international investment in each category of the three factors considered – type of asset (equities and bonds), business cycle (expansion and recession) and type of investor (institutional and noninstitutional) – , as well as the F-statistic and the respective statistical significance for the main, two-way and three-way interaction effects. International investment is measured by the weight of asset *a* in total value of assets (equity plus bond) of destination country *j* held by investor *k* of origin country *i* in year *t*. Statistical Significance: * $p < 0{,}1$; ** $p < 0{,}05$; *** $p < 0{,}01$.

Factor	Category	Mean	F-stat
Asset	Equity	36,56	1739,425***
	Bond	63,44	
Cycle	Expansion	50,00	0,000
	Recession	50,00	
Investor	Institutional	50,00	0,000
	Noninstitutional	50,00	
Asset*Cycle	Equity*Expansion	38,68	43,245***
	Equity*Recession	34,44	
	Bond*Expansion	61,32	
	Bond*Recession	65,56	
Asset*Investor	Equity*Noninstitutional	46,27	908,158***
	Equity*Institutional	26,85	
	Bond*Noninstitutional	53,73	
	Bond*Institutional	73,15	
Cycle*Investor	Expansion*Noninstitutional	50,00	0,000
	Expansion*Institutional	50,00	
	Recession*Noninstitutional	50,00	
	Recession*Institutional	50,00	
Asset*Cycle*Investor	Equity*Expansion*Noninstitutional	47,80	3,315*
	Equity*Expansion*Institutional	29,55	
	Equity*Recession*Noninstitutional	44,74	
	Equity*Recession*Institutional	24,14	
	Bond*Expansion*Noninstitutional	52,20	
	Bond*Expansion*Institutional	70,45	
	Equity*Recession*Noninstitutional	55,26	
	Equity*Recession*Institutional	75,86	

Consistent with the results of the previous analysis, the results show that the main effect of the factor type of asset is statistically significant and that, on average, investors assign a higher weight to bonds than to equities of each destination country (63% against 37%, respectively). The two-way interaction effect of factors type of asset and business cycle is also significant: the average weight assigned to equities is higher on business cycles of expansion than on business cycles of recession (39% against 34%, respectively), whereas the average weight assigned to bonds is lower on business cycles of expansion than on business cycles of recession (61% against 66%, respectively). Thus, in business cycles of recession, investors tend to increase the weight invested in less risky assets (bonds) and decrease the weight invested in more risky assets (equities), which is consistent with the flight to quality phenomenon.

The results also show that the two-way interaction effect of factors type of asset and type of investor is statistically significant. On average, institutional investors assign a higher weight to bonds than to equities of each destination country (73% against 27%, respectively). Similarly, noninstitutional investors assign a higher weight to bonds than to equities of each destination country (54% against 46%, respectively). Interestingly, noninstitutional investors diversify more their investment in each destination country by different types of assets than institutional investors.

The 3-way interaction effect is also statistically significant, indicating that the effect of factors type of asset and business cycle (i.e., flight to quality) significantly differs between the categories of the factor type of investor. On average, institutional investors assign higher weights to equities in business cycles of expansion than on business cycles of recession (30% against 24%, respectively), whereas they assign lower weights to bonds in business cycles of expansion than on business cycles of recession (70% against 76%, respectively). Similarly, noninstitutional investors assign higher weights to equities in business cycles of expansion than on business cycles of recession (48% against 45%, respectively), whereas they assign lower weights to bonds in business cycles of expansion than on business cycles of recession (52% against 55%, respectively). The same is to say that, in business cycles of recession, both institutional and noninstitutional investors tend to decrease the weight invested in more risky assets (equities) and increase the weight invested in less risky assets (bonds). This behaviour is consistent with the flight to quality phenomenon and is clearly illustrated by figure 6.2.

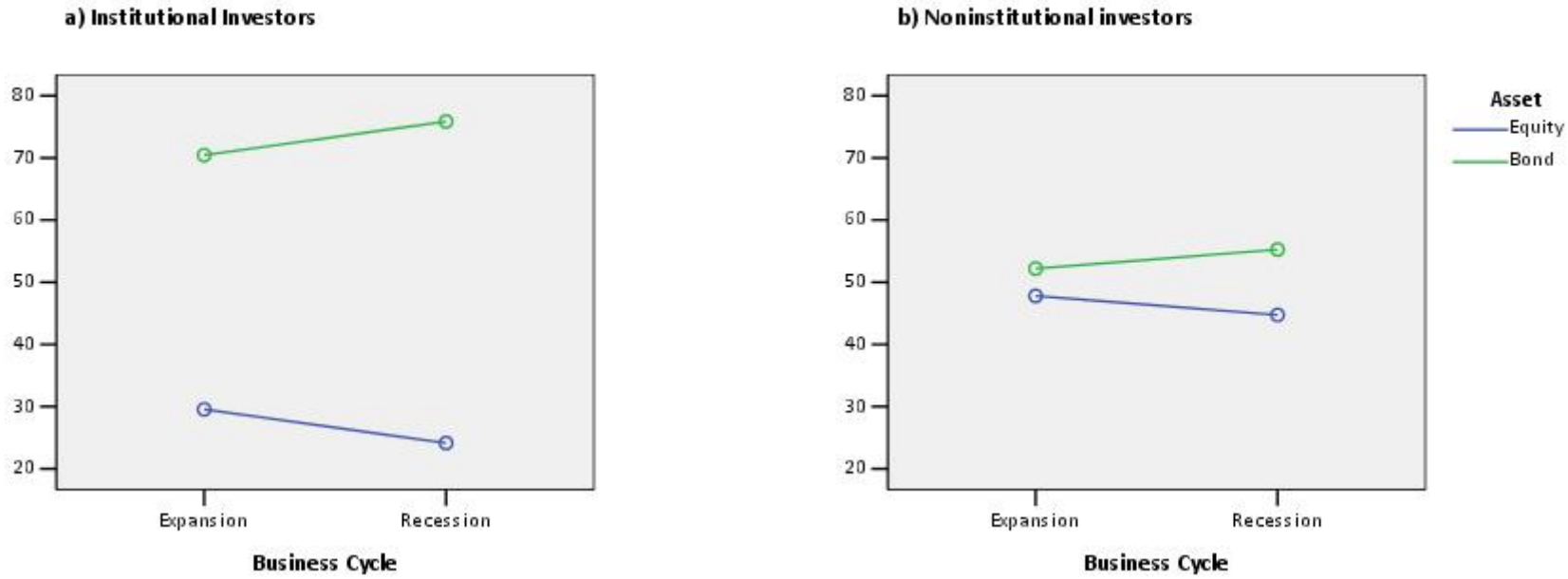

Figure 6.2: Flight to quality by type of investor

This figure illustrates the estimated marginal means of the weight assigned to equities and bonds of each destination country in different business cycles (expansion and recession) by institutional investors (panel a) and noninstitutional investors (panel b). The value of estimated marginal means can be consulted in table 6.2.

Note that the variation on the average weight assigned to each type of asset, due to changes in business cycles, is stronger for institutional investors than for noninstitutional investors. In fact, for institutional investors, a change of the business cycle from expansion to recession causes the weight invested in equities (bonds) to decrease (increase) by 6%[74], whereas, for noninstitutional investors, a change of the business cycle from expansion to recession causes the weight invested in equities (bonds) to decrease (increase) by only 3%[75]. This result suggests that more sophisticated investors (institutional) show a more pronounced reaction to changes in economic conditions than less sophisticated investors (noninstitutional), as suggested by Chalmers, Kaul and Phillips (2010). This effect, represented by the three-way interaction effect, is statistically significant.

6.4 Conclusion

The objectives of this chapter were twofold. First, by considering assets with different degrees of risk (equities and bonds) and different business cycles (expansion and recession), to investigate weather in business cycles of recession investors tend to decrease the international investment in assets with higher degree of risk (equities) and increase the international investment in assets with lower degree of risk (bonds), according to the flight to quality phenomenon. Second, by additionally considering investors with different degrees of sophistication (institutional and noninstitutional investors), to investigate whether the flight to quality phenomenon is more pronounced for more sophisticated (institutional) investors than for less sophisticated (noninstitutional) investors, as suggested by Chalmers, Kaul and Phillips (2010). For this purpose, a two-factor and three-factor ANOVA models, respectively, were applied to the international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries in the period 2001-2009, that comprises both business cycles of expansion and recession.

The results show that the flight to quality phenomenon is also observable in international investment as a change in business cycle of expansion to recession causes investors to significantly decrease the average weight invested in more risky assets (equities) and increase the average weight invested in less risky assets (bonds). This result is consistent

[74] Note that institutional investors reduce the weight assigned to equities from 30% in business cycles of expansion to 24% in business cycles of recession and increase the weight assigned to bonds from 70% in business cycles of expansion to 76% in business cycles of recession.

[75] Note that noninstitutional investors reduce the weight assigned to equities from 48% in business cycles of expansion to 45% in business cycles of recession and increase the weight assigned to bonds from 52% in business cycles of expansion to 55% in business cycles of recession.

with flight to quality and supports, at the level of international investment, the results of Kaul e Phillips (2007) and Chalmers, Kaul and Philips (2010). The results also show that the variation on the average weight assigned to each type of asset, due to changes in business cycles, is significantly stronger for institutional investors than for noninstitutional investors. This result suggests that more sophisticated investors show a more pronounced reaction to changes in economic conditions than less sophisticated investors, as suggested by Chalmers, Kaul and Phillips (2010).

This chapter offers an important contribution to the literature in so far it presents the first attempt to analyse the flight to quality phenomenon at the level of international, rather than domestic, investment. In fact, although the idea behind the flight to quality phenomenon is pretty intuitive, empirical evidence on its prevalence is very scarce and mostly confined to domestic investment (e.g. Kaul and Phillips 2007, Chalmers, Kaul and Phillips 2010). Moreover, this research analyses whether the flight to quality phenomenon in international investment is more pronounced for more sophisticated investors than for less sophisticated investors. As far as the knowledge goes, only Chalmers, Kaul and Phillips (2010) address this question, yet at the level of domestic, rather than international, investment.

Chapter 7: Conclusions, limitations and suggestions for future research

This research aimed to achieve four distinct, yet complementary, objectives.

The first objective was to investigate whether the determinants of international equity investment differ between investors with different degrees of information, experience and sophistication. This is one of the main contributions of this research as this issue has not been explored in the literature. For this purpose, the determinants of international equity investment of institutional and noninstitutional investors were analysed and compared.

The results suggest the important role of destination country size and information costs, as well as destination country equity market development and return in determining international equity investment of both institutional and noninstitutional investors, this way supporting the results of previous studies. More importantly, the results uncover differences in the determinants of international equity investment between institutional and noninstitutional investors. In fact, the results show that noninstitutional investors exhibit a more pronounced preference for equities of geographical nearby, contiguous and more transparent countries than institutional investors. Hence, as expected, the effect of information costs and familiarity on international equity investment is significantly stronger for less informed, experienced and sophisticated investors. Moreover, differences were also found within financial variables: the preference for more developed equity markets and the contrarian behaviour is more severe for noninstitutional than for institutional investors.

Furthermore, this research also contributes to the literature by analysing the influence of business cycles on the determinants of international equity investment, an issue that has not been addressed in previous empirical studies. The results show that the determinants of international equity investment of both institutional and noninstitutional investors are influenced by business cycles. The results also show that institutional and noninstitutional investors react differently to business cycles of recession: while the latter exhibit a more pronounced preference towards equities from more transparent countries, the former display a more pronounced preference towards equities that allow for higher risk diversification. This result reinforces the idea that the international equity investment of more informed, experienced and sophisticated investors is less influenced by information costs and familiarity and, at least in business cycles of recession, more influenced by financial concerns.

These results have important implications for the literature in so far as they show that the heterogeneity of institutional and noninstitutional investors in international equity

investment is not negligible and, therefore, should be taken into account. Also, the influence of business cycles in international equity investment should be taken into account.

The second objective was to investigate whether the determinants of international bond investment differ between investors with different degrees of information, experience and sophistication. This is also a main contribution of this research as this issue has not been explored in the literature. For this purpose, the determinants of international bond investment of institutional and noninstitutional investors were analysed and compared.

The results suggest the importance of destination country size and information costs, as well as destination country bond market development and return, in the determination of international bond investment of both institutional and noninstitutional investors, thereby corroborating the results of previous empirical studies. More importantly, the results suggest that there are few significant differences in the determinants of international bond investment between institutional and noninstitutional investors. In fact, within the information costs variables, only the preference for bonds of more transparent countries is significantly more pronounced for noninstitutional than for institutional investors. Within financial variables, the results suggest that the return chasing behaviour is significantly more pronounced for noninstitutional investors, whereas the preference for foreign bonds whose yields are more correlated with domestic bond yields is more pronounced for institutional investors. Hence, the results for international bond investment are quite short of expectations for two reasons: first, they do not allow to either support or reject the argument that information costs and familiarity are more important for noninstitutional than for institutional investors; second, they are contrary to the idea that financial variables, namely return and risk diversification, are more important for institutional than for noninstitutional investor. Overall, the results remain robust to the consideration of business cycles of expansion and, to a lesser extent, to the consideration of business cycles of recession.

Since there are few significant differences in the determinants of international bond investments between institutional and noninstitutional investors, the disaggregation of data by investor in the analysis of the determinants of international bond investment does not seem as imperative as in the case of international equity investment, although still convenient. The same conclusion can be taken for the influence of business cycles.

The third objective was to investigate whether the determinants of international equity investment differ from the determinants of international bond investment. In this respect, the contributions to the existing empirical literature are twofold: (1) the empirical analysis provides a statistical significance for the differences in the determinants of international equity and bond investment; and (2) the influence of business cycles, as well as the influence of

investors' characteristics, in the determinants of both international equity and bond investment is taken into account.

The results reinforce the importance of destination country size and information costs, as well as destination country financial market development and return, in the determination of both international equity and bond investment. More importantly, the results suggest that there are few significant differences in the determinants of international equity and bond investment. Although the effect of information costs on international equity investment tends to be stronger than on international bond investment, the differences between assets are not usually statistically significant, especially when the influence of financial variables is taken into account. Therefore, it is not possible to conclude that international equity investment is much more information intensive than international bond investment, as suggested by Gehrig (1993) and Portes, Rey and Oh (2001), among others.

These findings have important implications for the literature. In fact, they draw attention to the need of testing the statistical significance of the differences in so far as the mere comparison of the coefficients may lead to incorrect conclusions. Moreover, they draw attention to the need of disaggregating the data by business cycles and by type of investor in so far as the differences between international equity and bond investment are quite sensitive to the consideration of different business cycles (expansion and recession), as well as to the consideration of investors with different characteristics (institutional and noninstitutional investors).

Finally, the fourth objective was to investigate whether a change in business cycles of expansion to recession causes investors to decrease (increase) international investment in assets with higher (lower) degree of risk and to investigate whether this flight to quality phenomenon is more pronounced for more sophisticated than for less sophisticated investors. For this purpose, a two-factor and three-factor ANOVA models, respectively, were applied to the international equity and bond investment of institutional and noninstitutional investors from 20 OECD countries in the period 2001-2009, that comprises both business cycles of expansion and recession. This research also contributes to the literature by analysing the flight to quality phenomenon at the level of international, rather than, domestic investment.

The results show that the flight to quality phenomenon is also observable in international investment as a change in a business cycle of expansion to recession causes investors to significantly decrease the average weight invested in more risky assets (equities) and increase the average weight invested in less risky assets (bonds). The results also show that the variation on the average weight assigned to each type of asset, due to changes in business cycles, is significantly stronger for institutional investors than for noninstitutional

investors, thereby suggesting that the flight to quality phenomenon is more pronounced for more sophisticated than for less sophisticated investors.

Some limitations can be pointed out to this research. First, the use of a OLS regression with clustered-robust standard errors at the level of each origin country *i* might not be able to properly capture the variability of the dependent variable across five dimensions, namely at the level of each asset *a*, investor *k*, origin county *i*, destination country *j* and year *t*. This problem was attenuated by running separate regressions for each asset *a* and/or each investor *k*, by considering clusters at the level of each origin country *i* and by considering explanatory variables that capture the variability of the dependent variable across the other dimensions. Among the methodologies tested, this one produced the best results. In fact, OLS regressions with dummies to capture the fixed effects at the level of origin county *i*, destination country *j* and year *t* were also run, yet not without problems. Indeed, some dummies were automatically dropped by the econometric software, so the differences between investors (assets) obtained through the single pooled OLS regression for both investors (assets) did not correspond to the difference of the coefficients obtained in the separate OLS regressions for each investor (asset). Panel data models were also run by considering entities (i.e., the international investment of each investor *k* of origin county *i* in destination country *j*) varying across time (i.e., year *t*). However, panel data with fixed effects do not allow to consider the effect of time-invariant explanatory variables, such as distance, contiguity, common language and common currency, which are central to the analysis. Random effects allow to consider time-invariant explanatory variables, but they were rejected by the Hausman test.

Second, due to caveats on the disclosure of CPIS data, this research also had to deal with the problem of missing data. In fact, not all participating countries in the CPIS (currently 77 countries) break down international portfolio investment holdings by sector of the asset holder (i.e., by type of investor) and those who do, do it often incompletely (e.g. Austria does not disclose holdings for its banking sector; Germany does not disclose holdings for households). Moreover, occasionally, data is not disclosed for some years of investment (e.g. Portuguese international portfolio holdings are not available for the year 2003) and for some countries of residence of the asset issuer (e.g. international portfolio investment holdings in some destination countries are reported as unavailable, confidential or zero value). Despite these caveats, the CPIS provides the most comprehensive dataset on international portfolio investment holdings.

Third, this research is confined to OECD countries, which are mostly developed countries. In fact, the CPIS is limited in the disclosure of international portfolio investment holdings of and in developing countries. Since values of international portfolio investment

holdings less than 500.000 US dollars are reported as zero values, it is extremely difficult to know whether the lack of data for developing countries actually reflects the absence of international portfolio investment holdings or just reflects the absence of reporting.

In future research, these limitations will be taken into account.

The first two limitations will be addressed by replicating this research with mixed models, which allow to consider simultaneously fixed and random effects and are based on maximum likelihood estimation. Mixed models will allow to capture more properly the variability of the international investment at the level of each asset *a*, investor *k*, origin county *i*, destination country *j* and year *t*, by simultaneously considering fixed effects (e.g., at the level of each asset *a* or each investor *k*) and random effects (e.g., at the level of each origin county *i*, destination country *j* and year *t*). Furthermore, mixed models are based on maximum likelihood estimation, which is able to address the missing data problem more properly.

The third limitation will be addressed by extending the scope of this research to developing countries. It is expected that, in a near future, some progresses will be made towards an enlarged coverage of the CPIS and a more accurate disclosure of data.

Also in future research it would be interesting to further disaggregate data by investor type into finer categories within each of the two broad types of investors considered in this research (institutional and noninstitutional investors) and analyse the differences in the determinants of international equity and bond investment between different types of institutional investors (e.g., banks, mutual funds, insurance), as well as between different types of noninstitutional investors (e.g., nonfinancial companies, households).

Finally, the evidence of investors' contrarian behaviour in international equity investment and investors' return chasing behaviour in international bond investment also deserves further attention. However, addressing this issue would require data on international equity and bond investment holdings with higher frequency (e.g. on a monthly basis) and, unfortunately, the CPIS dataset only provides data on a yearly basis. Monthly international equity and bond investment holdings are available for the United States, but are not already available for OECD and European countries. Hopefully, in a near future this data will be available. This would be of great assistance to clarify some outstanding issues at the level of international portfolio investment.

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